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Editorial.

Weather and Plant diseases. It has been recognized from the earliest times that weather factors play an important part in the incidence and spread of diseases and pests of plants. Indeed, till the discovery of micro organisms, in the middle of the nineteenth century, the occurence of such diseases as blight, mildew etc. was attributed solely to adverse weather conditions. The discovery of pathogenic bacteria and fungi led the scientists of the period to err on the other extreme, and lay too much emphasis on the causal organism, underestimating the influence of weather factors. In recent times however, the intimate relationship that exists between weather and disease is again realised, and increasing attention is being devoted to research on what has been termed as the phenological aspect of plant diseases, and during the last fifteen years, a considerable volume of literature has been gathering round the subject. The conference of Empire Meteorologists, which met in 1929, focussed the attention of both meteorologists, and plant pathologists, on the need for intensive work in this direction, and emphasised the necessity for co-ordinated endeavour in their approach to the problem. In several countries as for example France, Germany and Italy, a system of forecasting diseases and pests has been organized by the Governments with a view to warn the farmers, though it must be admitted, that even in these countries they are yet a long way off in either correctly

forecasting the intensity of the disease, or forestalling it when its incidence is a certainty.

In India, the importance of the study of this subject cannot be over estimated. The periodical recurrence of a number of fungoid diseases, and insect pests on an epidemic scale, is laying a heavy toll on the cultivators and despite the great progress that has been attained during the last twenty-five years, in respect of our knowledge regarding these plant diseases and pests, very little organised work has been done on the phenological aspect. It is no doubt true that in the course of the investigations on plant diseases and pests, much valuable data, throwing light on the problem have been collected, but, these have been more or less of an isolated nature, and much work has yet to be done before the data can be analysed and correlated.

The reasons for the comparative neglect of this aspect are not far to seek. The science of plant pathology is itself in its infancy, in India, and the Mycologists and Entomologists of the Agricultural Departments (who are the only workers) had perforce, in the initial stages, to engage themselves with problems of immediate moment, and those which will yield results in a short period. Their attention was naturally directed towards the aetiological aspect of diseases, with a view to finding out cheap and effective remedial measures. The complex and uncertain nature of the phenology of diseases, which involves not only intensive laboratory study but also observations in the field carried over a large number of years, the absence of well equipped meteorological stations, except in a few centres; and the absence of contact between the meteorologists and agricultural officers have also been additional deterrant factors in the pursuit of the subject. To the above may also be added the general paucity of workers dealing with plant pathology and agricultural entomology. The study of these subjects has been almost entirely confined to the several Agricultural Departments, the Universities in India, except perhaps until very recently, not having directed their attention to it so far.

With the advent of the Imperial Council of Agricultural Research, however, there are signs that we are progressing towards a better state of affairs, and it is hoped that before long our knowledge regarding the relationship of weather to the more important diseases and pests of crops will have increased considerably.

In South India among the more important diseases and pests, a few occur periodically, and their outbreak in an epidemic scale would appear to be intimately connected with weather conditions. The *mahali* disease of arecanut though appearing year after year, with regularity varies with regard to its intensity and consequent damage to the crops. This has been attributed to changing monsoon conditions. The blast disease of paddy caused by *Piricularia oryzae* is also

intimately connected with the weather conditions that prevail throughout the duration of the crop. The mildews of various crops and the smuts are also in the same category. Among the insectpests, the swarming caterpillar (*Spodopteria mauritia.*) of paddy and the stem borer (*Schonoebius incertullus*) are dependent to a great extent, on weather conditions for their spread.

It therefore seems to us that attention devoted towards this aspect will be worthwhile, and we would suggest that an accurate record of the occurrence of plant diseases and pests be maintained in every agricultural station, so that with the accumulation of sufficient data it might be possible in future years within the limited means at our disposal, to correlate them with the weather data, and arrive at some conclusions which are bound to be useful to the farmers.

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Jubilee Celebrations. Our readers will be glad to learn that the Union has approached His Excellency Lord Erskine with a request to honour them by inaugurating the celebrations, of the Diamond Jubilee of the introduction of Agricultural Education in India, in July this year. The Hon. Mr. P. T. Rajan, Minister for Development has been requested to preside over the conference. It is hoped that the celebrations will be a great success.

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Mr. T. Lakshman Rao, Assistant Agricultural Chemist retired from service last December and a short sketch of his career will be found elsewhere in this issue.

DEVELOPMENTAL STUDIES IN RICE—I*

BY K. RAMIAH M. Sc., Dip. Agri. (Cantab)., L. Ag.,
and
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Introduction:— The aim of the plant breeder is to develop a most promising form with the yield as the ultimate aim. The carrying out of comparative yield trials with different rice varieties or with different strains of a variety of rice is always an important work of the rice breeder. The methods of conducting such trials have received considerable attention and have been brought to a high state of refinement due chiefly to the work of the Statisticians in this branch of agricultural science. Though such trials bring out yield differences between varieties or strains, the causes of such differences are still little understood and have not received adequate attention. Agriculturally, yield may be a single conception as so much of produce per unit area cultivated. Biologically, however, yield is a complex, an end result or integration of the vital activities of the plant which depend on the genetic constitution of the plant and the environment on which it is nurtured. The internal basic physico-chemical characters constituting the vital activities of the plant lead up to the manifestation of external yield characters as growth, tillering, ear size, etc.

The results of the outstanding work regarding the study of the fundamentals underlying yield in cereals by Prof. Engledow of Cambridge and his associates have been published in the several volumes of Journal of Agricultural Science. The aim of this study has been to understand the reasons for the difference in yield of the cereals as expressed in the morphological development of the plant. This knowledge is essential to judge definitely under what conditions a particular form can be grown successfully. The knowledge about the adaptations of varieties to different conditions is mostly traditional based on long experience of practical cultivators. Although one may know that certain forms of rice are more adapted to certain conditions, very little is known about the reactions which the plants exhibit when grown under such conditions. The need for the study of the development of the plant in all its phases and its relation to yield is therefore emphasised. Tillering, both a morphological and a physiological character, common to all cereals is a very important developmental phase of the rice plant. Any favourable treatment to which the plant may be subjected brings about quick response in the increase in the number of culms. Besides soil, some of the agricultural practices that influence tillering are the time of planting, spacing, manuring etc. That tillering apart from its behaviour due to

* Paper read at Indian Science Congress 1935.

environment is a varietal character is well brought out from the study of this character in the large number of varieties—all pure lines—grown at the Paddy Breeding Station, Coimbatore, year after year. Some are inherently poor in the number of tillers they produce while others are more prolific. Since effective tillering i.e., the number of ears per plant is definitely related to yield its study becomes important. Besides tillering, the other factors that contribute to yield in rice are the size of the ear, its density and the size of the individual grain in the ear. The present article treats about the results of studies on the development of tillers, and the size of ear and their relation to final yields in a few pure lines. The effect brought out by factors like changes in the environment, manuring etc, on these developmental phases, and consequently the yield, was investigated with one or two pure lines over two or three seasons and these are dealt with in section II.

Tillering. *Discussion of literature.* Considerable work has been done in cereals in general and on rice in particular on this important attribute of the plant. In a majority of cases the attempt has been to bring out the relationship between tillering and the environmental conditions under which the plant grows. Thompstone (1915) in Burma has found that the high yielding strains have been found among those whose tillering mean is but a little higher than that of the original type while some of the strains with high tillering mean have yielded but comparatively poor outturns of grain. He concludes that long durationed varieties, generally, tiller more than the short durationed ones. Summers (1921) in Ceylon had evidence to show that among the important Ceylon rices short duration paddies possessed a greater tillering capacity in general than those of longer periods of maturation. Ramiah (1927) writing on the growth phases of rice varieties observed that long duration varieties as a rule produced a larger number of tillers than short duration varieties. Saravayya (1932) at Maruteru has found that varieties that finish their tillering in the early stages yield better than those which prolong their tillering phase. Joshi (1923) gathered data regarding the influence of time of planting, age of seedlings, planting of singles or bunches, application of manures, spacing etc, on the tillering and finally concluded that tillering was hereditary in character and that while phosphatic and potassic manures had no influence on tillering, nitrogenous manures did have, and that with the increase in the number of tillers artificially induced, there was a large percentage of loss of late tillers with reduction in the size of the ear. Hector (1921) finds that spacing has a great influence on the number of tillers per plant and the number of grains per tiller but no effect on the weight of the individual grain. Jacobson (1916) differed on this point in his work on the "Correlative characters of the paddy plant", and he was supported by Thompstone. He found that tillering of the individual plant was negatively correlated with the

number of grains per panicle and the size of grain. Dionisio Calvo (1927) and Rodrigo (1924) gathered data on the effect of spacing on tillering and yield, and came to the conclusion that the physiological expression of the tillering power of the rice plant was made greater by wider spacing between the hills Inagaki of Japan (1897) as far back as 1897-98 made some experiments on the effect of planting in singles, doubles, trebles, etc, on the total number of shoots per hill, and with the data, developed a mathematical way of estimating the possible number of shoots that would be developed with different number of seedlings per hole, if the shoots in one of them were known. It must be understood however, that in most of the available literature the tillering has been denoted by the number of final ears found at harvest. Engldow's work on cereals has more than emphasised the importance of studying the progress of tillering right from germination up to the time of harvest as it is only then that differences due to variety or environment can be evaluated.

Material and methods. Ten Coimbatore strains varying in duration from 150 to 180 days were all planted side by side with even spacing one foot by six inches under as uniform conditions as possible. Uniform blocks of 300 plants in each variety were chosen and care was taken to avoid plants near the b rders and uneven patches, plants damaged by insects, plants adjoining gaps. etc. The tillering of each of these 300 plants in every block was counted every week. Although for this study 300 plants were actually under observation it was later observed adopting different methods of sampling, that under very uniform conditions obtaining in the plots at the Breeding Station and with crop planted with seedlings of uniform growth, a population of even 50 plants was enough to study tillering. At each weekly count every tiller large enough to be seen i. e., after it has come out of the subtending leaf sheath was counted and no attempt was made to differentiate the size of the individual tillers. As towards the end of the tillering phase death of tillers also commences, count of dead and living tillers at each stage was made note of and to avoid confusion the dead tillers were actually removed from the plants at the time of tiller counts.

General Observations. Unlike in other cereals, irrigated ragi (*Elusine coracana*) being an exception, rice is invariably transplanted i. e., the seed is first sown in the seed-beds, and after the lapse of a period, which would vary according to the life duration of the variety of rice, the seedlings are pulled out and transplanted in open fields puddled and levelled. Though the direct sowing of the seed in the fields is also prevalent in certain tracts such practice is never adopted in tracts where conditions and facilities for transplanting are available. The seedlings after transplantation take some time, 6 to 10 days, to revive as indicated by the casting off of old leaves and production of

the new. Although certain conditions like good tilth in the soil, good vigorous seedlings, cloudy weather and light showers at planting, all favour quick establishment of the plants, observations at Coimbatore have shown that the rapidity of establishment is a varietal character. It must also be understood that the roots that remain with the seedlings at the time of transplanting do not function. It is only the fresh roots that start from the nodes after planting that are of help to the plant. In an experiment carried out at the Paddy Breeding Station, Coimbatore, varying degrees of pruning the roots at the time of planting including ones where the roots were all completely removed were put under comparison and it showed, that the pruning had no effect on the subsequent growth and development of the plant.

The production of tillers or side shoots often starts even in the seed-beds particularly on the borders of the beds where the plants have more space and access to light. Ordinarily, side shoots do not arise from the axils of the two scale like structures at the base of the young seedling. By following the course of development of a side tiller, it will be seen that in very early stages the tiller is completely encased by a pinkish while scaly leaf. As the tiller grows, the scaly leaf also grows with it to a fair size. By careful observation, it is possible, even in grown up plants, to differentiate between a primary and secondary tiller, by the position of this scale. Normally a bud is borne in the axil of each leaf and thus a shoot may grow out from each bud. But actually tiller production is restricted to the nodes near the surface of the soil. The tillering zone is restricted to half to one inch in length along the main axis and situated about one to two inches below ground level. The internodes at this zone are all very much suppressed. If planting is done rather deep the bottom most internode elongates up to about one inch below ground level and then the tillering starts. When the crop is planted late, or when it lodges flat during later stages, shoots from the higher nodes may also develop but they are rarely ear bearers. Ratooning is nothing but the development into tillers of dormant buds at nodes below and above ground level of the stubble left over. There are certain types in the Coimbatore varietal collections which have a predisposition to tiller at higher nodes even under normal field conditions. But here the process may probably be rightly called branching rather than tillering and such branches do mature ears. This habit in certain rices has been recorded by Jones (1925)

Formation of tillers. The tillering starts from below and as they are being formed progressively along the main axis, some of the early tillers might start producing secondary tillers in their turn. When there is a large amount of tillering there appears to be a definite relation between these secondary and tertiary tillers (tillers produced by secondary tillers) and the total number as the data in

Table I would indicate. The secondary tillers T_1, T_2, T_3,.....do not produce tertiary tillers unless the total number of tillers for the plant exceeds ten or twelve.

Table No. I.

Tiller Distribution. *Variety—GEB. 24.*

Total No. of tillers per plant including the main-shoot.	Number of side tillers produced by											
	T_0	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_{1-1}	T_{2-1}	T_{3-1}
3	2	...	...	...	...	...	...	...	...	...	...	...
4	3	...	...	...	...	...	...	...	...	...	...	...
5	4	...	...	...	...	...	...	...	...	...	...	...
6	4	1	...	...	...	...	...	...	...	...	...	...
7	4	1	1	...	...	...	...	...	...	...	...	...
8	4	2	1	...	...	...	...	...	...	...	...	...
9	5	2	1	...	...	...	...	...	...	...	...	...
10	5	2	2	...	...	...	...	...	...	...	...	...
11	5	3	2	...	...	...	...	...	...	...	...	...
12	5	3	2	1	...	...	...	...	...	...	...	...
13	5	4	2	1	...	...	...	...	...	...	...	...
14	5	4	2	1	...	...	...	...	...	1	...	...
15	5	4	3	1	...	...	...	...	...	1	...	...
16	6	4	3	1	...	...	...	...	...	1	...	...
17	6	4	3	1	1	...	...	...	...	1	...	...
18	6	4	3	1	1	...	...	...	...	1	1	...
19	6	4	3	2	1	...	...	...	...	1	1	...
20	6	4	4	2	1	...	..	...	...	1	1	...
25	7	5	4	3	2	...	...	...	...	2	1	...
32	8	5	5	3	3	2	2	...	...	2	1	...

The arrangement of the tillers in every case is alternate. While it may appear difficult to trace the chronological relationship of the several tillers in a plant directly in the field it can be made out by removing the plants and dissecting the parts. The course of tiller formation appears to be identical in all the strains studied (Table II), there being no varietal difference in the mode of tillering or in the distribution of the tillers in the plant. Summers (1921) believes that secondary or tertiary tillers appear in two separate phases. As a matter of fact, after a certain stage, primary, secondary, and even the tertiary tillers begin to produce tillers all at the same time. Under field conditions, however, the tiller distribution is not so absolutely systematical. Some buds fail to develop and others die after some development. During advanced stages of growth, crowding occurs with the result that the process of tillering with respect to one or more side tillers comes to a stand still while others more favourably situated continue to do so.

Tillering commences two weeks after transplanting and goes on rapidly for about four to five weeks thereafter. The active period of

tillering is a varietal character mainly dependent on the duration of the variety. This period may be definitely less, 3 to 4 weeks only in a variety of four months and below—Ramiah (1927). Apart from the varietal characteristic, abnormal conditions like too much spacing, late planting, excess of nitrogenous manures in the soil, insect attack like the borer, sometimes cause the normally dormant buds to get active and produce tillers and thus prolong the vegetative phase. Excess of water supply to the fields either artificially or due to excessive precipitation, may accentuate a fresh tillering phase resulting in a few small tillers late in the season. Such prolonged tillering naturally leads to a high percentage of abortive tillers, uneven heading and unsatisfactory harvest. The contribution of such later tillers to harvest is only straw.

Reduction in Tillering. When once the tillering phase has reached the maximum under normal conditions in spite of the ideal conditions for active growth being present, some of the late formed tillers start dying off. Probably the mother tillers cut off all supplies of nutrition to such late tillers and as these late tillers do not develop any root system to lead an independent existence they naturally die. In all probability the primary stem of rice under transplanted conditions acts as a host for the subsidiary daughter tillers for some time only. All the late and undesirable tillers are thus eliminated by the time the plant passes into the reproductive phase. This reduction in tillering is almost the same in all the varieties studied as will be apparent from the data in Table II. The final percentage of ears to the maximum

Table No. II

Tiller Production and Reduction.

(as percentages of the maximum number of tillers produced per plant).

Date of observation (Number of days after planting)	19	26	34	40	47	55	61	68	76	90	98	104	112
Variety	Percentage.												
GEB. 24	...	44	76	98	100	98	87	82	74	73	71	...	...
Co. 2	37	66	93	97	100	92	91	91	73	69	...	68	...
Co. 3	36	70	95	98	100	92	90	87	77	...	68	...	67
Co. 5	44	75	95	98	100	95	90	85	73	...	65	...	64
Co. 6	36	60	95	97	100	95	94	92	83	...	71	68	67
Co. 4	39	61	88	94	100	93	91	85	73	...	59	56	55

tillering produced varies in the different varieties but the percentage of functional tillers to the total in the different tiller classes is practically the same in all the varieties (Table III). The proportion of functional tillers is found to be definitely less in a late variety like Co. 4.

Tiller production and yield. The relationship between yield and tillering is interesting. In wheat the increase in tillering is associated

with greater yield and greater tiller production is a sign of greater vigour is evident from the yield per ear gradually increasing as the

Table No. III.

Percentage of Functional Tillers in the Different Tiller Classes.

Variety.	Number of tillers per plant.														Co-efficient of correlation (r) of tiller production to ear formation.
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Co. 1 ...	84	87	89	87	87	86	85	78	...	...	...	...	...	...		0·81±0·014
Co. 2 ...	...	70	66	69	71	65	70	68	67	70	...	...	...	...		0·88±0·008
Co. 3 ...	...	...	...	73	69	69	72	66	69	67	69	69	...	...		0·83±0·013
Co. 4 ...	...	...	...	...	...	54	62	56	60	59	51	51	52	54		0·71±0·022
Co. 5 ...	...	...	...	66	67	67	68	65	61	68	63	66	64	...		0·86±0·012
Co. 6 ...	...	76	76	70	67	66	67	63	...	...	...	...	...	...		0·72±0·021
Co. 7 92	88	86	84	82	80	76	82	...	...	...	...	...	...	...		0·72±0·019

number of tillers increase in the plants. In rice, in several of the varieties examined, increase in the number of functional tillers is directly proportional to the yield per plant (Table IV).

Table No. IV.

Yield of grain per plant in grams.

Variety.	No. of ears per plant.											
	3	4	5	6	7	8	9	10	11	12	13	14
GEB. 24	...	...	6·2	9 4	9·9	10·8	13·1	13·3	15·6	15·4	...	...
Co. 1	3·8	5·2	6·9	7·9	9·5	11·0	12·6	15·8	...	...	...	...
Co. 2	...	7·1	8·0	9·5	11·3	11·8	14·0	16·4	...	...	...	...
Co. 3	...	...	9·1	10·5	12·6	14·2	16·7	18·1	20·4	...	...	...
Co. 4	...	8·2	10·2	13·0	13·4	14·6	15·8	17·1	...	...	...	...
Co. 5	...	9·0	12·0	13·7	15·1	17·0	20·8	21·5	23·4	26·4	...	...
Co. 6	6·4	8·1	9·4	11·4	13·2	16·3	16·6	...	...	...	...	...
Co. 7	5·6	7·4	10·3	12·6	14·8	16·6	21 1	...	...	...	...	...

The relationship is more or less linear. In the case of the very late variety like Co. 4, the yield per plant does not increase in the same proportion as the increase in number of tillers. As regards weight of grain and the yield per ear there is not much difference in the plants with different number of ears for several of the varieties studied.

Table No. V. A

Yield of grain per ear in grams.

Variety.	Number of ears per plant.											
	3	4	5	6	7	8	9	10	11	12	13	14
GEB. 24	...	...	1·23	1·57	1·41	1·35	1·46	1·33	1·42	1·28	...	...
Co. 1	1·25	1·31	1·37	1·31	1·35	1·38	1·40	1·58	...	...	...	...
Co. 2	...	1·77	1·60	1·59	1·62	1·48	1·55	1·64	...	...	...	...
Co. 3	...	...	1·81	1·75	1·80	1 77	1·85	1·81	1·85	...	...	...
Co. 4	...	2·04	2·03	2·16	1·92	1·82	1·76	1·71	...	...	...	...
Co. 5	...	2·24	2·39	2·29	2·16	2·12	2·31	2·15	2·13	2·22	...	...
Co. 6	2·12	2·03	1·88	1 90	1·88	2·04	1·84	...	...	...	...	...
Co. 7	1·87	1·86	2·06	2·10	2·12	2·07	2·34	...	...	...	...	...

Table No. V. B

Weight of 100 Grains in Grams.

Variety.	Number of ears per plant.											
	3	4	5	6	7	8	9	10	11	12	13	14
GEB. 24	...	...	1·80	1·82	1·75	1·79	1·75	1·74	1·76	1·72	...	...
Co. 1	2·34	2·29	2·31	2·30	2·26	2·30	2·29	2·25	...	...	...	...
Co. 2	...	1·96	1·02	1·98	1·99	1·95	1·99	1·90	...	...	...	...
Co. 3	...	...	2·13	2·15	2·14	2·16	2·17	2·18	2·12	...	...	...
Co. 4	...	2·45	2·48	2·47	2·49	2·49	2·47	2·48	...	...	...	...
Co. 5	...	2·00	2·02	2·04	2·00	2·02	1·99	2·00	1·95	2·01	...	...
Co. 6	2·07	2·04	2·07	2·01	2·07	2·06	2·03	...	...	...	...	...
Co. 7	2·12	2 08	2·04	2·08	2 03	2·02	1·95	...	...	...	...	...

But in certain varieties like GEB. 24, Co. 1, Co. 7, etc., there is a perceptible, though slight, increase in the yield per ear as the number of ears per plant increases. It is possible that in these varieties increase in the number of ears, apart from its being a normal physiological activity of the plant is an indication of the plant's greater adaptability to respond to environmental changes which affect the production of ears. This is also evident from the fact that the percentage of functional tillers in plants with different number of tillers is almost the same in these particular varieties, whereas there is a slight and gradual drop in the percentage of functional tillers as the total number of tillers increase in the case of other varieties.

Critical period of tillering. The increase in tillering beyond a certain stage does not result in ears. If the ears formed follow the same order as the development of tillers, the plant produces enough tillers to result in ears even two to three weeks before the maximum tillering phase is reached. If we denote the particular stage in tillering where the number of tillers produced is equal to the number of ears formed as the 'critical period' all tillering beyond this period is a waste. As the data given in Table iii would show any increase in the number of tillers per plant leads to a corresponding increase in the number of ears. Since, however, the average yield per ear is almost the same in all the ear classes, an increase in the number of tillers per plant is bound to result in an increased yield per plant. Thus to enhance yield the attempt must be to so adjust the agronomic practices to enhance the rate of initial tiller production as much as possible. It is possible, however, that two varieties or two strains of a variety possessing the same average number of functional tillers per plant might differ in their yields and such a difference has to be accounted for by some yield attribute other than number of tillers. In such a case it is usually the ear size that is responsible for the difference as will be apparent from the below mentioned case. Two strains of *anaikomban*, a Tinnevelly variety have been compared for yield for a number of years and one of them

7567 always recorded a higher yield than the other strain. A comparative study of the developmental phases in the two strains showed that while the average number of ear bearing tillers per plant was not very different in the two, the average length of the ear and hence the number of grains per ear was always more in 7567 than in the other.

Table No. VI

Comparative yield attributes of Anaikomban strains.

	Anaikomban strains.	
	7567.	7566.
Maximum average tiller production per plant.	7·9	7·3
Average number of ears per plant.	4·8	4·4
Percentage of functional tillers.	61	60
Average yield per plant.	9·4 grams.	7·6 grams.
Average yield per ear.	1·96 „	1·73 „
Weight of 100 grain sample.	1·92 „	1·95 „
Average number of grains per ear.	102	89
Average length of panicle.	228·5 mm.	196·2 mm.
Number of grain per unit length 10 cm.	4·5	4·5

Individuality of tiller. To determine the individuality of the tillers and the relationship between the chronology of tillers and their contribution to yield a small subsidiary experiment was conducted. The aim was to find out the effect on yield by planting seedlings with three initial tillers, and also by removing the main, second or both the side tillers to elucidate the function of the respective tillers. Periodical counts of tillers were taken and the final yields were determined. The experiment was conducted with two varieties for two seasons. Though the yield of the plant was the highest where all the tillers were left in tact, the reduction in yield due to the removal of the second or third tiller was not very marked, but when the main tiller was removed the yield went down considerably. As regards the total number of tillers produced per plant it was highest where all the tillers were left in tact closely followed by the one where the third tiller alone was removed. Where the main tiller alone was left the tillering was the same as when the second and third tiller were both left. Where the second or third tiller alone was left to develop, the tillering was very poor and the yield was very much reduced. Incidentally it was also observed that wherever the main tiller by itself or in combination with others was left to develop, the plant flowered definitely a week earlier than plants where the main tiller had been removed. The results of this experiment definitely indicated the advantage of the lead of the main tiller in point of age and development towards the contribution to (a) total tiller production; (b) total yield and (c) earliness in flowering.

Development of the ear. Tillering in rice represents an aspect of vegetative phase while the rapid growth in height in later stages foretells the approach of the reproductive phase. Data gathered

during growth studies have yielded some useful information on the subject of ear formation. The factors at work that make a plant to stop vegetative growth and go on to the reproductive phase are not yet sufficiently understood. After a time, all the tillers in the rice plant produce their ear primordia in quick succession. Practically they all appear in the course of a week. Taking a medium duration variety like Co.2 or Co.3, which has an active tillering phase spread over four weeks, T_1, T_2, T_3 appear during the first week while the late ones, T_6, T_7, T_{1-3}, T_{2-2}, T_{3-1} etc. arise during the fourth week. The first batch will therefore have a lead of about 3 weeks to start with, but by the time they come to the primordial ear formation the interval gets reduced by about a week. The dates of ear emergence converge still further and the interval may get reduced to even four days. Thus the rate of development of the later formed tillers is much more rapid than in the earlier formed ones; the later the tiller formed the more rapid is its development.

The frequencies of tillering at each count when plotted give more or less a normal curve. In the later counts a few plants with the modal value for tillering at each count were pulled out and dissected to examine at what stage the ear primordia started forming, and what the connection was between tillering and ear formation. While the figures given in Table II show that the maximum tillering phase is reached almost at the same time for all the varieties under study, i.e., about six weeks after planting, the examination of primordial development showed that ear formation was independent of tillering and was mainly a varietal characteristic. Since no variety of rice under four and a half months in duration had been included in this study the observation was continued on a definitely early variety under four months, in the following season. The approximate time at which the ear primordia was formed was found to depend on the duration of the variety even in this case.

In *kar* Strain Co.10 which is definitely under four months in duration, the formation of the ear commences 15 days before the maximum tillering phase is reached. In varieties—GEB.24 and Co.1 which are 4½ months to 5 months in duration the ear formation begins a few days before the maximum tillering phase, and in varieties Co.2, Co.3 which are about 5½ months in duration the ear formation synchronises with the stage at which the tiller production is at its maximum. In late varieties of over six months' duration, like Co.4 and Co. 8, there is an interval of over three weeks between maximum tillering and the commencement of the ear formation. (Fig. 1)

The time at which the ear formation commences has an important significance in yield investigations as the knowledge can be made use of to adjust one of the agronomic practices namely the application of a fertiliser as a top-dressing to the crop, to enhance the yield. The time of

application of the fertiliser in its relation to the size of the ear formed is dealt with in section II.

Among the varieties studied primordial ear formation commences 24 to 31 days before the date of emergence of the ear tip from the leaf sheath. The variation in this interval might probably have been wider if varieties earlier to and later than these under study had been included in the experiment. At the first instance the primordium looks like a fleshy globose protuberance measuring about $\frac{1}{8}$ to $\frac{1}{4}$ m.m. By the time it is $\frac{1}{2}$ m.m long, a few hemispherical excrescences are observed at the base, the number of which gradually increase in a short period. These bodies which represent the branches of the panicle, produce afterwards some spherical growths which are the rudiments of spikelets and these are laid down alternately on either side of the basal axis, (Fig. II). When it is 5 m. m. long tiny spikelets get differentiated at the top with stalks at their bases. The rings of hairs that are found along the rachis (in a well developed ear) become apparent even now. The process thereafter is elongation of the different parts of the panicle already formed, and formation of new spikelets at the base. The spikelets taken out of the middle of the ear of a tiller of the modal class for a particular week were measured for length and breadth. From the measurements made it can be stated that the elongation in length of spikelets in the middle and top of the ear is complete by the time the ear completes its elongation i. e., about 15—20 days after the formation of ear primordia. During the week preceeding emergence, the small spikelets at the base develop and assume normal size by the time the ear comes out of the sheath. Though the general trend of spikelet development is from top to bottom it is not quite so regular.

The ear ordinarily takes three days to completely emerge out of the leaf sheath after the appearance of its tip above the last leaf junction. Spikelets commence opening a day or two after they are exposed. Majority of spikelets in a panicle complete opening in six to eight days after they commence to do it, though it may take eight to ten days for all of them to open. The sequence of their opening is not very systematic though the general trend is from tip to base on the sub-spikes.

Rate of shoot-growth. Incidental to the study of tillering, observations on the growth rate were also recorded in the different varieties under study. The height of the rice plant in its earlier stages is mainly contributed by the length of its leaves. There is practically no elongation of the internode. As the tillers throw out new leaves the increase in height is due to the production of longer leaves in succession, with each leaf sheath projecting above the tip of the previous one. It has been recorded previously—Ramiah (1927) that in early varieties growth in height is continuous till they enter the reproductive phase while in

Fig. I.

Tillering and Commencement of Ear Formation

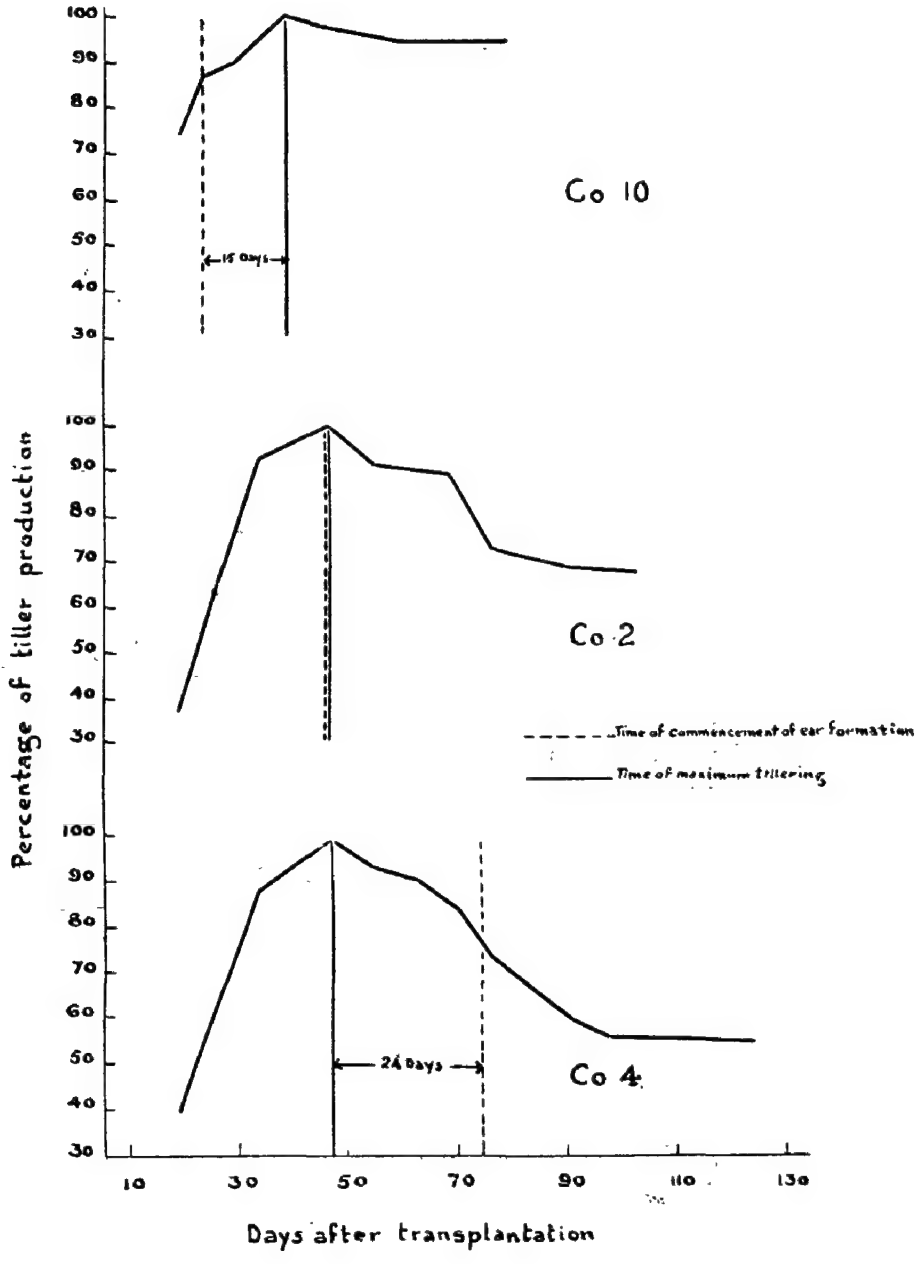
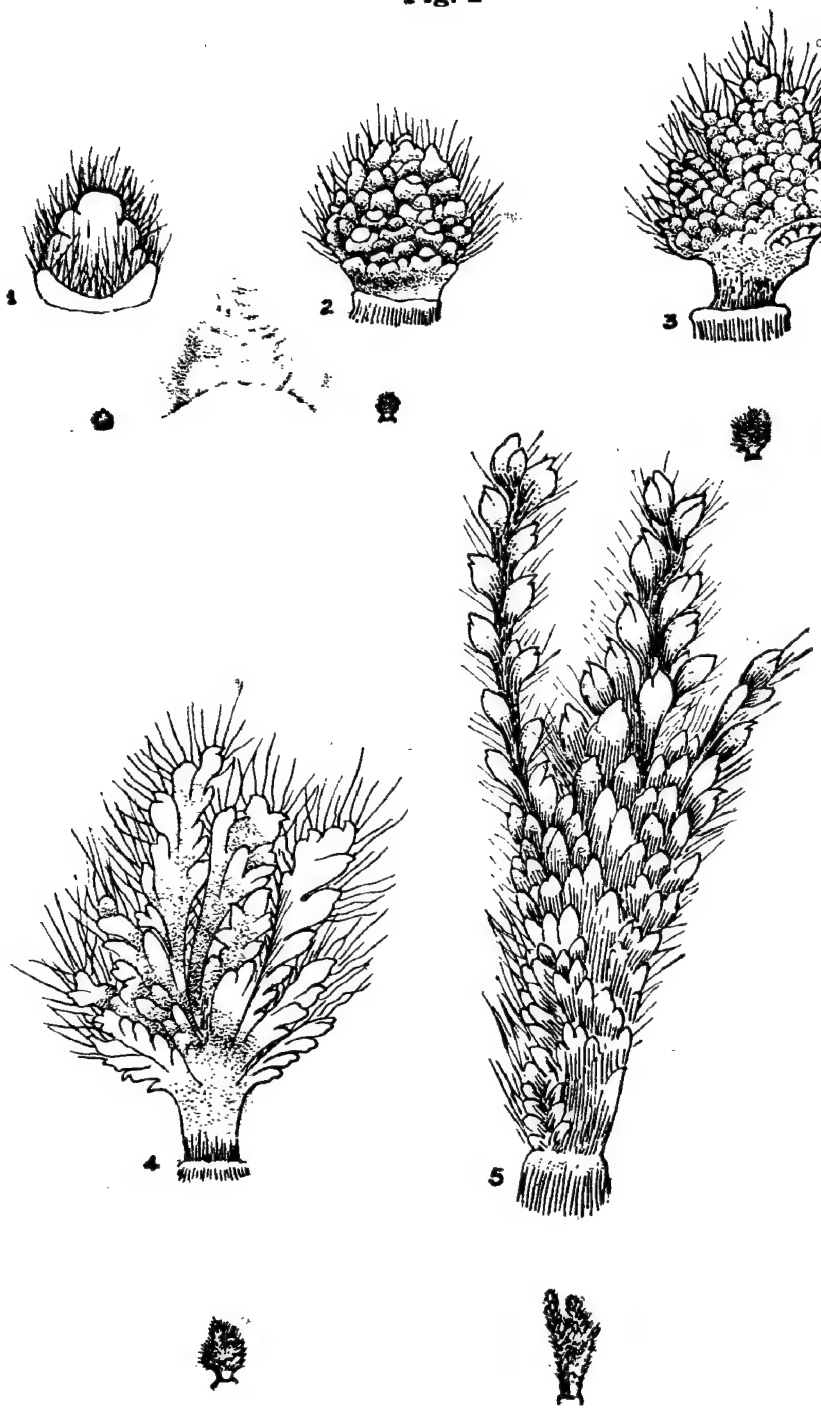


Fig. 2



Development of the Primordium (2 to 7 days.)

late varieties it is discontinuous. Nearly 90 per cent of the growth in height is attained during the month preceeding flowering and is largely contributed by the top-most internode, panicle and ear.

Table No. VII.

Lengths of Different Parts of a Paddy Shoot
(as percentages of the height of the shoot).

Variety.	Internodes (numbered from top down)					Peduncle.	Ear.	Height of shoot.	Remarks.
	i	ii	iii	iv	v				
GEB. 24	21·4	16·2	11·0	3·5	1·2	28·0	18·6	100	Plants with the modal number of tillers were taken at random from an early planted area. Only tillers with the modal height were taken into consideration.
Co. 1	21·6	12·9	7·5	3·6	1·5	32·3	20·4	100	
Co. 2	21·6	15·2	9 5	4·2	2·1	29 2	18·2	100	
Co. 5	22·7	15·7	9·9	4·8	2 9	27 0	17·0	100	
Co. 7	21·2	15·3	9 6	4·7	1·8	29 0	17·9	100	

In six of the varieties, GEB. 24 and Co. 1 representing early, Co. 2, Co. 3, and Co. 7 medium, and Co. 4 late, after the count of tillers every week, six plants with the modal value for tillering were picked out from the adjoining portions in the field and were dissected carefully to denote the chronology of tillering and to measure the lengths of the different parts. By removing leaf after leaf from the bottom of every tiller the internodes between are exposed and finally a stage is reached when there will be seen the rudimentary or developing ear on the shoot, unless the plant is still in the active tillering phase.

The process of dissection and recording of measurements for even six plants every week formed a laborious process. Even in a pure line no two plants are absolutely alike and since growth measurements cannot be carried out on the same plants every week, the only feasible way of recording growth measurements was to select every week, plants with the modal value of tillering for that week and record their measurements. Then there is the question of fixing the unit of observation whether it should be the whole plant or only a tiller. It was found that there was considerable range of variation between the tillers of the same plant or tillers of the same chronology on different plants taken as samples for dissection. Since observations made on number of leaves per tiller, number of elongated internodes per tiller, height of shoot, sequence of tillering and its bearing on the date of emergence of the ear, length of emergence of the ear, length of peduncle and length of flag leaf, size and number of spikelets per ear, weight of grains etc., did not show significant variation in any of these characters with reference to the chronology of the tiller, the recording of measurements at successive intervals was confined to tillers that showed the modal shoot height.

Shoot growth. A rice plant during the process of tillering, and until the formation of the primordial ear does not show any elongated

internodes. The only exceptions to this finding are the deep water paddies which throw out elongated internodes even in early stages s multaneously with tillering. Vigorous shoot growth starts only with the commencement of ear formation.

The elongation of the different parts of the shoot follows a regular sequence. If a plant has five internodes, the basal one starts its growth first, quickly followed by the one next above it. The next two commence their growth a week after and almost complete it by the time the top-most one and peduncle begin to grow.

Table No. VIII.

Growth of Shoot.

(N. B.—The numbering of internodes is from top to bottom).

Variety.	Date of observation.	Interval in days.	Growth in length in m. m. Internodes. I	II	III	IV	V	VI	Peduncle.	Ear.	Total height of shoot.
GEB. 24	21/10	...	...	...	23	21	...	...	...	2	46
	28/10	7	...	5	50	26	1	...	...	11	93
	31/10	3	5	50	58	17	1	...	1	94	226
	3/11	3	13	102	61	14	...	...	4	230	424
	7/11	4	14	121	67	31	...	...	5	243	481
	*11/11	4	136	137	66	20	...	...	120	237	715
	14/11	3	246	149	77	22	1	...	361	248	1104
Co. 1	13/11	...	...	1	27	2	...	...	...	4	34
	20/11	7	3	30	32	9	...	...	...	60	134
	*27/11	7	47	66	38	14	2	...	16	232	415
	4/12	7	214	66	36	8	...	...	369	240	933
Co. 7	13/11	...	...	...	2	24	...	...	...	knob	26
	20/11	7	...	1	14	26	3	...	...	2	46
	27/11	7	5	43	45	37	4	...	...	80	214
	4/12	7	51	104	59	29	...	...	15	242	500
	*11/12	7	247	129	42	23	...	...	300	241	982
	8/12	7	273	127	54	29	...	...	344	243	1070
Co. 2	26/10	...	...	...	2	6	1	...	...	knob	9
	2/11	7	...	1	15	32	...	...	...	1	49
	9/11	7	2	12	74	59	7	...	...	27	181
	16/11	7	12	87	97	54	16	...	5	228	409
	*23/11		131	155	95	44	3	...	75	248	751
	30/11	7	275	151	94	48	6	...	344	244	1162
Co. 3	3/11	...	...	2	9	59	36	...	...	1	107
	10/11	7	1	8	64	70	26	2	...	15	186
	17/11	7	8	52	99	69	24	...	1	139	392
	*24/11	7	28	107	102	68	32	...	10	2·4	601
	1/12	7	244	162	108	70	24	...	313	259	1180
Co. 4	25/11	...	...	1	7	47	44	5	...	0·5	105
	2/12	7	...	...	...	...	..	...	...	1·7	..
	9/12	7	2	22	82	61	21	2	...	26	216
	16/12	7	10	76	151	69	32	3	1	154	496
	*23/12	7	30	131	163	68	45	3	11	223	674
	30/12	7	281	199	142	64	26	...	360	230	1302

* Indicates the date of emergence of the ear.

Table VIII shows the comparative growth of the shoot in the different varieties. From the figures in the table it is clear that the ear completes its growth in length a week to 10 days before the date

of emergence of the ear. During this period, the top-most internode and peduncle proceed with their elongation while the internodes below stop almost all growth. The process of elongation of the shoot in general continues four to five days after the emergence of the tip of the ear from the leaf sheath. Late ears take a day less to complete the process.

Incidentally notes were taken regarding the average number of leaves in a tiller, number of elongated internodes per tiller, height of the shoot, sequence of tillering and its bearing on the date of emergence of the ear, length of emergence etc., and they are recorded below:—

Number of leaves per tiller. The number of leaves above the prophyll or tillering zone of the main and side tillers that have formed daughter tillers is a fairly fixed character for a variety under normal conditions. The number is more in the late than in the early varieties. In the varieties studied the range is from five to eight leaves per tiller. (Table IX).

Table No. IX.

Number of leaves per Tiller.

(Above the prophyll or tillering zone).

Variety.	Duration in days.	Average number of leaves per tiller.
GEB. 24	149	5·1
Co. 2	157	5·9
Co 3	161	6·4
Co. 5	164	6·8
Co. 6	176	7·7
Co. 4	192	7·9

The flag leaf and the leaf previous to it commence their development almost along with the ear. Each tiller will have three to six functioning leaves at a time, and the number goes down to three by the time the crop completes the flowering. When it is ready for harvest all except the flag leaf dry away.

Number of elongated internodes in a tiller and height of tiller. As the number of leaves produced in a tiller is a variable character, the number of internodes also has a similar variability. Actually a tiller may have only four to six elongated internodes, the late varieties having a larger number. Early planting and rich soil tend to increase the usual number of elongated internodes and this is generally a predisposing cause for the crop to lodge even before it is quite ripe. The height of a tiller made up by the internodes, peduncle and ear highly reacts to variations in environments. To note the individual variations of the different tillers in a plant with regard to height, ear emergence, length of emergence etc., ten plants with the modal, five with the

maximum and five with the minimum class of tillers were marked in the ten varieties under study and the observations recorded.

Poor tillers are invariably short. Plants with the modal and maximum number of tillers do not show much variation in average height. The height of an individual tiller in a plant seems to entirely depend upon its vigour and environment rather than on its chronology. It is not always the primary shoot that is the tallest. Later formed tillers are at times even taller than the first formed ones but those that are formed very late remain short. In spite of initial differences, late formed tillers speed up and attain the same height as the first ones by the time the plant starts flowering. Sometimes in a tiller which has a fewer number of internodes than the normal, the height is made up by the extra elongation of the peduncle. Generally the heights of different tillers on a plant of normal growth are almost the same, the differences being within ten percent of the mean. It has always been a useful criterion in selecting single plants for economic value which have a fair number of ear bearing tillers all of the same height.

Sequence of tillering and ear emergence. Omitting Co. 1 and Co. 7 which had been planted late, the observations recorded below hold good for all the varieties under study. A plant takes five to seven days to complete the emergence of all its ears whether it is a good, average or poor tillerer. If the plant happens to be particularly poor, it may take a slightly longer time. Though very often the first formed tillers throw out their ears first, it is not always the rule. The forwardness at emergence, as in the case of height, seems to depend upon the vigour and environmental conditions of individual tillers. The modal date of emergence of the ear is slightly earlier in a well tillered plant than in one with fewer tillers. Tillers that are formed late in the season are invariably late in earing and they are also definitely shorter in height.

Spikelets – number, setting and size. The length as well as the number of grains per ear, are almost the same in early formed tillers, but the number of spikelets per unit length generally decreases gradually with the lateness in tiller formation though the vigour of the individual tiller might have much to do with it. The percentage of setting in a variety seems to be a fairly definite character. Within the variety, however, the percentage of setting is low in 'late formed' tillers. As regards the weight of grain, those on the early tillers are usually heavier than those in the late tillers. Very late and poor tillers, as in the case of ratoons, definitely have smaller grains.

Summary. Tillering is an important developmental phase in cereals. It is best studied by counting the tillers produced by each plant in a sample of a population. For a transplanted crop with a pure line, and in well uniformly prepared fields, a sample of fifty plants may be found enough to carry on this study. Active tillering phase

commences about two weeks after planting and will be in full swing for three to five weeks depending upon the duration of the variety. When the tillering phase has reached its maximum, reduction in tiller number starts by the death of the late and ill developed tillers. The 'critical period' of tillering i. e., the stage at which enough tillers are formed to result in ears, is reached two to three weeks before the maximum tillering phase is attained. The trend of distribution of tillers in plants of different tiller classes follows a systematic course and it does not seem to vary much among the varieties under study. Under normal field conditions the percentage of functional tillers to the total tillers in a plant is almost the same irrespective of the number it produces, but this percentage is evidently a varietal character, being low in later varieties. The yield per ear and weight of grain in the different tiller classes are almost the same. Hence it follows that keeping the environment the same, any increase in the average number of tillers per plant or per unit area correspondingly goes to increase the yield of grain per plant or per unit area. As early conditions have a marked predetermining influence on after development, to obtain good yields the plant must be provided with optimum conditions for vigorous growth by the production of a large number of tillers earlier to the 'critical period.'

Ear development. The interval between the completion of tillering and commencement of ear formation seems to depend on the duration of the variety. The interval increases with the increase in duration. In the case of early varieties and in late planted crops ear formation commences even before tillering is completed. The relationship between tillering and ear formation is a useful criterion to be made use in adjusting the time of application of a fertiliser to the crop. The formation of the ear primordia commences about 24 to 31 days before the date of emergence of ear tip, the interval apparently depending on the duration of the variety. The ear completes its growth in length about a week before its date of emergence. The linear development of all the spikelets and the mechanical strengthening of the rachis, rachilla and glumes are complete by the time of its emergence.

Shoot growth. Nearly 90 per cent of the height in a mature rice shoot is attained during the month preceding flowering. Active growth of shoot starts almost with the commencement of the ear development. Elongation of the different parts of the shoot proceeds from base upwards in regular succession. A week or ten days before the emergence of the ear, the top-most internode and peduncle starts growth while those lower below would have reached their full length. Growth of all parts of the shoot stops with the commencement of general flowering, which is four to five days after the emergence of the ear tip from the shoot.

Bibliography.

1. DIONISIO CALVO (1927) *Phil. Agrist.* Vol. XVI.
2. ENGLEDOW F. L. & WADHAM S. M. (1923) *Jour. Agri. Sci.* Vol. XIII.
3. ENGLEDOW F. L. & RAMIAH K. (1930) *Jour. Agri. Sci.* Vol. XX.
4. HECTOR G. P. (1921) *Rep. Oper. Depart. of Agri. Bengal* Appendix—5.
5. INAGAKI (1897) *Bull. Coll. Agri. Tok. Imp. Univ. Japan* Vol. III.
6. JACOBSON H. O. (1916) *Phil. Agri. Rev.* No. 9.
7. JONES J. W. (1925) *Jour Ameri. Soc. Agro.* 17.
8. JOSHI K. V. & OTHERS (1923) *Bombay Bull.* No. 114.
9. RODRIGO A. P (1924) *Phil. Agrist.* Vol. XIII.
10. RAMIAH K. (1927) *Jour. Mad. Agri. Students' Union.* Vol. XV.
11. SARAVAYYA Ch. V. (1932) *Mad. Agri. Jour.* Vol. XX.
12. SUMMERS F. (1921) *Trop. Agrist.* Vol. LVI.
13. THOMPSTONE E. (1915) *Agri. Jour. Ind.* Vol. X.

MARKETING OF CULTIVATORS' COTTON AT TIRUPUR, MADRAS PRESIDENCY

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(*Note:*—Investigations into the finance and marketing of cultivators' cotton in Tirupur town and in two representative villages of the tract were carried out by the author with the aid of a scholarship from the Indian Central Cotton Committee in 1932 and 1933 and two reports were submitted, the first for the town and the second for the villages. The article below is an abridgement of the first. The other, on growing, finance and marketing of cotton in the villages of the tract has been published in "Agriculture and Livestock in India" of January 1935.)

The town of Tirupur situated in the middle of Coimbatore district has grown in importance in recent years due to its cotton trade and is now one of the largest centres of cotton trade in South India. The total quantity of cotton dealt with per annum is about 80 to 100 thousand bales. Cotton grown in the surrounding area, to a radius of about 50 miles, is almost all marketed through Tirupur. Cambodia and *Karunganni* are the chief varieties disposed of, *Uppam* and *Nadan* being received in small lots. The proportion of these arriving at Tirupur may be estimated as follows:—Cambodia, 60%; *Karunganni*, 30% *Uppam* and *Nadan*, 10%. The investigation was carried out from April to July of 1932, as the marketing season at Tirupur is normally from March to August. A total of 590 sellers were examined in 90 days.

The Market Organisation. The whole of the Municipal town of Tirupur serves as a market place. Spot purchases are generally the rule though sales are also effected on the forward contract system by the town merchants. Situated in the central part of the town are about 30 commission *Mundies* or depots, the owners of which act as financiers and commission agents for the sellers of *kapas*. There is storage accomodation available in these *Mundies* and advances are

made against the security of *kapas* stored. There are over 20 ginning factories within the town and connected with these are the town dealers who purchase *kapas*, gin it and sell as lint for ready price or supply to the agents of mills with whom they could enter into a contract. Sellers of *kapas* (village merchant or the cultivator) therefore effect sales either in the commission *Mundies* or in the yards of the ginning factories.

There are no market committees, no rules and by-laws and no system of control over the conduct of sales, deductions and allowances. Records of purchase and sales are maintained by the merchants or the *Mundies* concerned. During the years 1918-1920 an attempt was made to start the Holmes Cotton Market under the auspices of the Tirupur Municipality and controlled by the then Coimbatore Cotton Marketing Association, with a view to regulate the purchase and sale of cotton. The marketing yard and some buildings were constructed at a cost of about Rs. 50,000. The dealers and merchants of Tirupur, however, were against the starting of the market as it was likely to affect their interests. By-laws were however prepared and submitted to Government for approval in March 1920. Just then the Madras District Municipalities Act of 1884 was replaced by that of 1920 according to which the Municipal Councils ceased to have adequate powers to start and run cotton markets. As a result no market was organised, the merchants had their own way and the buildings and yard were not used for the purpose for which they were intended.

The Commercial Crops Markets Act of 1933. After much enquiry and consultation this Act was introduced and passed in 1933, as an enabling measure, whereby the Government could declare any area as a regulated market for any specified commercial crop. Cotton, groundnut and tobacco have been declared to be commercial crops for the present, in connection with this Act. The first market under this Act is to be organised at Tirupur for cotton from this year. As per regulations under the Act the Market Committee of 12 members has just been formed. This consists of five members elected from among the growers, four from the merchants, one from the Municipality and two nominated by the Government. The Committee will frame suitable by-laws to run the market within the Municipal limits of Tirupur which has now been declared to be the market area. The editorial note in the November 1935 issue of this Journal discusses fully the scope of this Act and the formation of the first market for cotton at Tirupur.

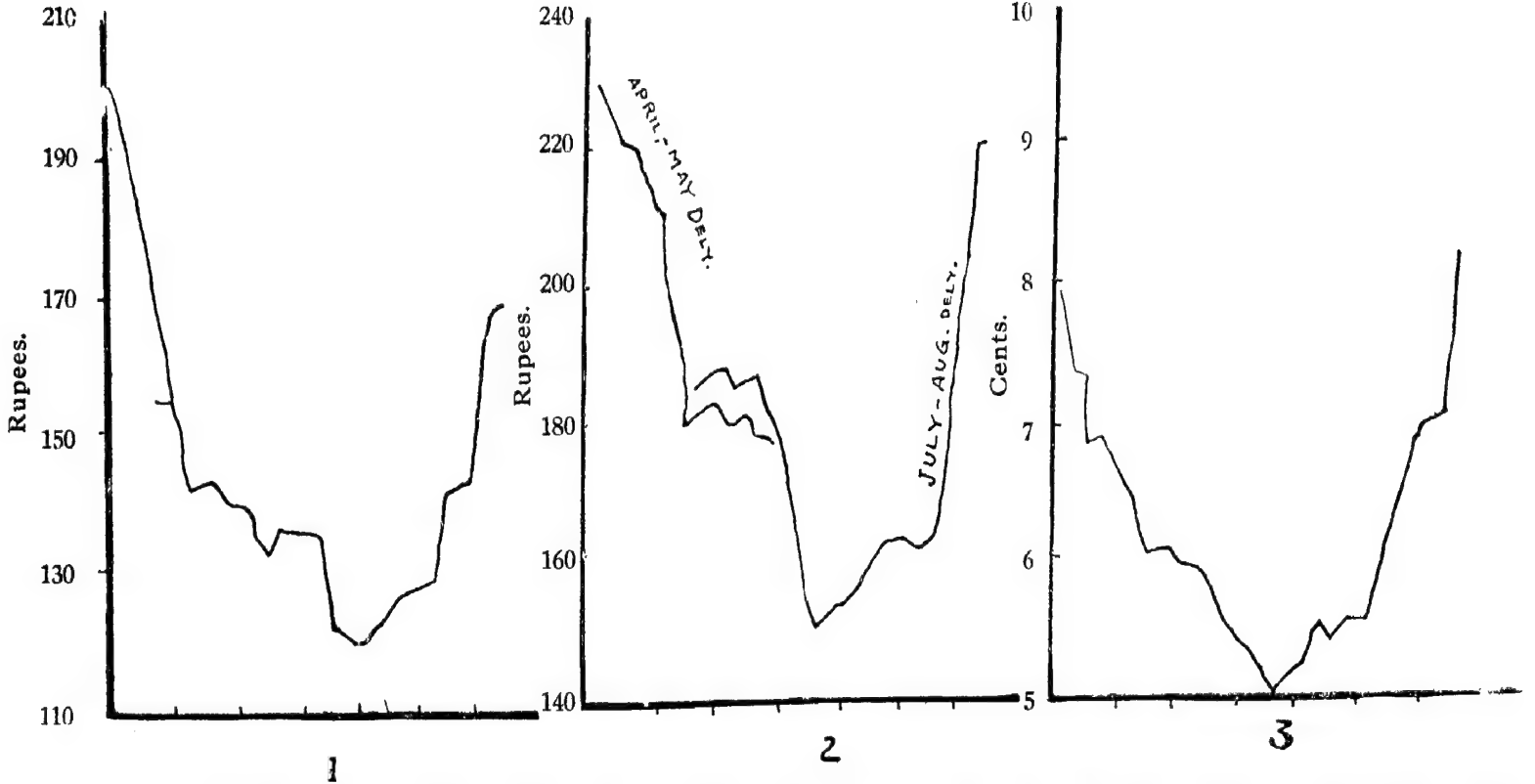
The System of Purchase and Sale. There are two systems, viz., buying of ready *Kapas* or lint and the forward contract system. But the latter is in vogue only during the busy part of the season and mainly encouraged by Messrs. A. & F. Harvey and Binny & Co. Though these firms purchase as lint they make it a condition to inspect the

kapas before ginning and satisfy themselves as to quality. They have got their own standards of quality, fixed up according to their requirements, and the rates paid are dependent upon these. The merchants entering into such forward contracts for supply of cotton within a specified period, usually a month, purchase *kapas* in the villages through their agents and also within the town limits, in the commission *Mundies* or factory yards where ready *kapas* is always available. Agents of consumers up country purchase lint through-out the season according to their requirements from the factories or lint *Mundies*.

The seller, bringing in *kapas* for sale at Tirupur, can sell it by himself in any of the factory yards or even on the road-side, or take it to a commission *Mundy* and get the *Mundy* man's help in the disposal. *Kapas* arriving at the *Mundy* is unloaded, marked and stored. Buyers come round, inspect the *kapas* of each bag and make their own offers. The *Mundy*-man argues and tries to settle as best a price as possible. When settled, the weigh-man weigh them and the buyer arranges to cart the *kapas* to the godown he has fixed. The cartage is however, paid by the *Mundy*-man out of the commission he collects from the seller. Disputes are rare as the buyer takes care to examine well the contents of each *borah* or bag before settling the price. The price of stained or inferior quality *kapas*, kept in separate bags, is separately settled. If there is any dampness, settlement is made beforehand for any allowances to be made in weight. The *Mundy*-man pays the seller immediately the total cost of *kapas* sold less the commission at Rupee one per *pothi* of 260 lb. But the buyer pays the *Mundy* only in the evening. If the prices are unfavourable, the stuff will be stored for future sale and an advance paid to the seller not exceeding 75% of the value of the *kapas* stocked. The seller can then return to the village for purchasing another consignment of *kapas* or if he is a cultivator use the money for cultivation and other expenses.

The seller, taking his *kapas* to any of the ginning factory yards can easily secure the help of any of the petty brokers available at such places. At this place he has to effect the sale the same day as no storage accommodation is given in the factories. The commission due to *mundies* is saved, the broker is paid only two annas per *pothi* and often satisfactory prices are obtained. Some effect the sale without the aid of the petty broker. Here also the buyers inspect the *kapas* in each bag and settle the price. Then the weighment is made in the factory yard where the buyer proposes to gin and the cost of *kapas* paid. During the season under investigation about 50% of the total arrivals of *kapas* was sold in this manner without the aid of commission *mundies*.

Employment of Brokers. The employment of a broker is purely voluntary. Generally the buyers do not employ brokers. Most of the



Price of Lint of best Quality Cambodia Per Candy of 520 lb. 1932.

Price of Broach Cotton in Bombay Per Candy of 784 lb 1932.

Price of Cotton in New York in Cents Per lb. 1932.

sellers, however, find it more convenient to have the aid of the broker. Such of those who are available near the factories, have no capital, but many of them are smart and experienced. The commission *mundy*-man is an agent, broker, banker and a friend all rolled into one, and the sellers who are 'customers' to his *mundy* seem to have full confidence in him. The commission *mundies* provide storage space without charge and would have invested several thousands of rupees, each of them, in godowns and as advances to sellers.

Rates. No rates are posted or announced, but the prices are directly affected by those of Bombay first and then of New York. The curves included at the end of the article show how Tirupur prices fluctuate in unison with those of Bombay and New York. There is no organisation among buyers to fix rates or for fixing grades of *kapas* or lint. It is left to the individual buyer and seller to settle a satisfactory price among themselves. Good deal of bargaining takes place, and when there are a large number of buyers in the market the prices tend to go up. Following the rise in Bombay or New York prices, the merchants freely push up Tirupur prices. Again at about the end of the stipulated forward contract period there may be a rush of buyers and at that time the prices have a favourable turn. Information about ruling prices in the Bombay market is obtained privately through telegraph and radio and also through "The Daily Bombay Telegraphic Cotton News" published daily. The *mundies* in their turn inform their customers (the sellers in the villages) by post daily the day-to-day variation in prices at Tirupur so that arrivals at Tirupur can be regulated.

Weighment. Beam scales, hung from a tripod of bamboos or iron rods, are used for weighment both in the factories and in *mundies*. The weights are W. & T. Avery's iron weights and a set used for each scale is as follow: – 56 lb. (six of them); 28 lb.; 14 lb.; 7 lb ; 4 lb.; 2 lb.; and 1 lb. One of the weighmen, well experienced in the work, holds one of the chains of the weight pan with his left hand and now and then gently pulls to feel how much more weight he should add. When the pans are just about to counterpoise, he calls out the total. The payment is made at the rate per *pothi*, maunds and pounds as per equivalents in lb. noted: –*Candy*—784 lb.; *Pothi*—280 lb.; Maund—28 lb. At the time of investigation a *candy* varied from 500 to 520 lb. and a *pothi* was equivalent to 260 lb. Recently the Government fixed the weight of a *candy* at 784 lb. as that of Bombay and the *pothi*—at 280 lb. The weighmen in the *Mundies* are paid by the Mundy-man out of the commission and in the factories by the dealers or merchants purchasing kapas. In the former the rate paid is per *pothi* of kapas and in the latter it is per *candy* of lint ginned.

Disputes, Deductions and Allowances. No disputes were noted either in the Mundies or in the factories. Evidently the sellers and

the buyers are satisfied with the prevalent methods of transaction, deductions and allowances. The following deductions and allowances are made:—

A. For *kapas*.
   1) 1 lb. whenever the pointer in the beam scale stops exactly in the middle, the weights exactly counter-balancing the bags.
   2) 11 lb. per 1000 lb. in weight deducted for wastage, impurities, dust, stains, etc. This is really 1% plus one lb. for every 1000 lb.
   3) In the factory yards 1 lb. less is noted when the weights are noted after each weighing. In one place the weights were noted 2 lb. less. This practice is not found in *Mundies* and is to be deprecated.

B. For Lint.
   1) 1 lb. per candy is deducted for sample purposes.

Customary Charges. 1. Commission. In the commission *Mundies* Re. 1 to Rs. 1—2—0 per *pothi* of kapas and Rs. 2 per candy of lint sold, are charged as commission. These include charges for loading, unloading, weighing, carting and the amount for charity. 2. Charity. One anna per *pothi* of *kapas* and two annas per candy of lint, are charged to the seller under charity. No separate accounts are maintained for amounts received by way of charity and no charitable institutions are maintained for the benefit of the sellers. 3. Brokerage. A brokerage of two annas is paid to the broker per *pothi* of *kapas* sold with the aid of a broker. For lint it is four annas. 4. Insurance. *Kapas* stored in Mundies is not insured, but for lint stored the insurance charge is four annas per *candy*, for a period not exceeding six months.

Storage and Advances against Deposit: It is only in the commission *Mundies* there is storage accommodation available for *kapas* brought into Tirupur for future sale. The godowns in factories are utilised for stocking *kapas* of merchants ready for ginning as well as lint and seeds for sale. The Co-operative Trading Society provides storage godowns for its members, a large number of whom are merchants themselves. The Society and the *Mundies* advance money against deposit of *kapas*. The interest charged in *Mundies* is said to be from 12 to 15% but actually no interest is charged for periods less than a month.

Statistics of Arrivals and Sales. There is no common record for arrivals and sales at Tirupur. It is not possible to judge with any accuracy the total arrivals of *kapas* on any particular day as the carts arrive at all times of the day. Lint also arrives for sale at Tirupur from several places up-country where there are ginning factories. An idea of the sales effected on each day can be had if one takes pains to

make enquiries of all the dealers, merchants and factories and then make an estimate of the total.

The Sales Society. The Tirupur Co-operative Trading Society has been working for some years with great success, but a good many of the members belong to the merchant class of the town. The society advances on produce pledged upto 70% of the value. There is a branch working at Udamalpet. The Society is running a large seed farm for the improved strain of Cambodia cotton, financed by the District Bank of Coimbatore. The Indian Central Cotton Committee subsidises this seed multiplication scheme by which it is hoped in the course of a few years, to maintain an assured supply of the improved type of Cambodia cotton seed to all the growers in the Tirupur tract. The society, like the *Mundies*, charges commission on sales of *kapas* and lint, besides godown rent and insurance fee for storage. An interest of about 9% is charged on advances made on the security of produce.

Transport and Communications. Seven metalled roads converge at Tirupur from different directions and no seller has experienced any difficulty owing to bad communications for any long distance, even though many of them wend their way from villages and towns 30 to 50 miles distant from Tirupur. The majority of the villages in the tract appear to have at least one metalled road running not far from their vicinity. The country double bullock cart is practically the only vehicle for transport of *kapas* or lint, though in the town of Tirupur carts drawn by coolies is more common for transport within the town limits. Lint purchased by the Coimbatore mills is transported by the double bullock cart rather than by train as the former is the cheaper mode.

Concluding Statement on Market Investigations. It is worthy of note that only 8 % of the sellers examined were actual growers who brought their own kapas for disposal at Tirupur. Out of 125 sellers examined during July, 30 were what may be termed 'cultivator traders', persons having some area of garden, either of their own or in their family, but turned into traders for the season, or for the past few years.

1. Number of days the market was visited, 96.
2. Number of sellers examined, 590. (In Mundies, 127; in Factories, 463)
   Growers, 50; Traders, 540.
   During July :-Growers, 13; Cultivator traders, 30; Professional traders, 82.
3. Number of sellers who did not sell on the same day, 46.
4. Number who did not submit to the customary market deductions, None.
5. Number who did not pay brokerage, 58.
6. Number who had taken advances, 72. (60 from Mundies and 12 from factory owners or merchants).

AN ACCOUNT OF THE STUDENTS' TOUR

BY J. RAGHOTHAMA REDDY, II B. Sc. Ag. Class.

From Coimbatore to Anakapalli, from Central districts to the northern-most portions of the Circars is no mean distance and yet we arrived after 42 hours at the destination in a state of enthusiasm that would reflect credit to any party on tour.

On the bright morning of 6th January we all set ourselves well to our task, but alas, our enthusiam and rosy dreams of future were not to continue long and we received the rudest shock by the sudden passing away of one who toiled, enjoyed and suffered with us for well nigh over a year and a half, a loss to all and an irreparable one to many.

Then followed two dreary days of monotony, of reflection, and of dead and dying enthusiasm. Early next day the last rites over, the party settled down to reconcile itself to the tragic incident and succeeded but partly.

The Sugarcanes at Anakapalli were of great interest and while we followed the Superintendent round the experimental area we admired his force of conviction as he explained the way he brought down the cost of production to Rs. 2—8—0 per ton of sugarcane.

Next morning we were invited to Kasimkota where Mr. D. Appa Rao an 'old boy' of the college is working hard at his extensive orchards. Oranges of all types—sour and sweet—Batavian and pomeloes of all descriptions were well represented in this garden of his. The proprietor explained at length the various stages of orchard growing in a manner that easily showed him to be a scientific horticulturist. He very kindly treated us to tea and bade us farewell appealing to us at the same time to go back to our lands. Our thanks are in no small measure due to him.

Our next halt was Samalkot where we stayed at the farm and soon acquainted ourselves with the peculiarities of deltaic agriculture. Later in the day we visited the Sugar Factory as also the distillery attached to it and saw with wonder the dirty-looking semi-solid palmyrah jaggery change into shining crystals of sugar and strong-smelling alcohol. Our later visits in company of Mr. Raghava Rao Asst. Director of Godavary Districts to Peddapuram silk factory and to the extensive canefields of the Jaggery Factory and the orchards of the proprietor were no less instructive than the rest.

Moving forward we reached Rajamundry on 11th and went out straight to Dhowleshwaram to see that magnificent achievement of Science—the grand anicut—across *Sapta* Godavary. Thanks to the kindness of Mr. Raghava Rao we pleasantly 'cruised' on board a steam launch and moved on to the *lankas*, for an hour and returned.

Late in the evening we reached Royal Nurseries at Kadiam and no sooner had we arrived than we were treated to a sumptuous tea, whereafter the proprietor took us round and explained the business side of his concern. We thus left for our lodgings with the happiest recollections of a day well spent. Early next morning we visited the famous citrus gardens associated with the name of the great social reformer and literateur, the late Veerasalingam Pantulu.

Leaving Rajahmundry at noon we reached Maruteru nearly at dusk after a rail and road journey.

Maruteru took us a full day to study and we all heartily enjoyed the hospitality of the Staff and left the place, to put it in the language of the Superintendent, "much wiser than we came".

Masulipatam was our next camp where besides the usual enquiries we played and lost a hockey match against the Noble College.

The last camp of the tour was at Bezwada where thanks to the generosity of the great philanthropist K. Nageshwara Rao Pantulu we got, palatial lodgings at his private home.

The next visit of interest was to the citrus gardens at Peddavadlakudi where soil and climate have contributed to the eminence of the industry with the total absence of any advanced horticultural practices.

Guntur with its chillies and tobacco came next and kept us busy for a whole day. The Government farm with its enthusiastic staff was more interesting to us than any other place. The party they gave us was certainly the best.

The tour came to a close with a brief but an interesting visit to Veeyyur Sugar Factory. We were very kindly received by the Manager and were shown round by the heads of the respective departments. We left greatly impressed by the magnitude of the factory and the sound co-operative basis of the great concern and wished all success and prosperity to the premier Indian Sugar Concern of the South.

Our thanks are due to all gentlemen within and without the agricultural department who were responsible for making the tour both instructive and enjoyable.

To Mr. Raghava Rao, A. D. A. of Godavary Districts to Mr. Venkataraman, Supdt. of Maruteru Research Station and Mr. Vittal Rao, Manager of Guntur Station we owe a special debt of gratitude.

To Mr. Raghavachari, the leader of the tour to whose ability and kindness not a little of the success of the tour was due, we offer our heartiest thanks. Lastly to Messrs. B. Suryanarayana and V. Suryanarayana we are thankful for what all they have done for us.

THE PASSING AWAY OF KING GEORGE

In order to express deep regret at the passing away of His Majesty King George V, a meeting of all the residents of the estate was held at the Freeman Hall at 4-15 P. M. on Friday 24th January 1936 under the joint auspices of the Madras Agricultural Students' Union, the Indian Officers' Association, the Association of Economic Biologists, the Officers' Club, the Ladies' Club, the Students' Club, the Fieldman's Association and the Association of Upper Subordinates.

Mr. R. C. Broadfoot who presided over the joint meeting spoke as follows :—

Mrs. Munro, Gentlemen,

This meeting has been called under the auspices of the various clubs and organisations at the Agricultural College to publicly express our sorrow at the death of His Majesty King George V. Similar meetings have been held all over the world and all have proclaimed the love and high regard in which His Majesty was held by every one. As a King by precept and example he was kingly, sympathetic to all his subjects and a shining example of what the head of the Empire should be. His Silver Jubilee celebration held last year must have been to him a very great joy and his speech on that occasion when he dedicated the remaining years of his life to the service and welfare of his subjects was an expression of sincerity which will not be forgotten. None realised at that time that his death was so near but we have the satisfaction of knowing that his work up till the time of his death was for the peace and welfare of all Nations. His death was peaceful as befitted a gentleman who had lived a full good life, and today we mourn his passing with very sincere regret. The British Empire has been blessed with many wise and good rulers but King George V, will live in history because of his broad sympathetic outlook and good works. With these words I now move the following motion of condolence and request that those present will stand and receive.

This meeting places on record its sense of deep sorrow at the demise of His Majesty King George V and respectfully offers its heartfelt sympathy and condolence to the members of the Royal family.

The following resolution was also then moved from the chair and passed.

This meeting begs to record its sense of loyalty and devotion to the new King Emperor, His Majesty King Edward VIII.

THE SIXTH INTERNATIONAL BOTANICAL CONGRESS.

Sir E. John Russell, Director of the Rothamsted Experimental Station at Harpenden, England, speaking before the Sixth International Botanical Congress, called attention to the fact that plants, constantly sucking upward the water that trickles and oozes downward through the ground, profoundly affect the character of the soil in which they grow. In the eastern part of England the water drainage through cultivated soils is only about half that through uncultivated soils. The whole nature of the soil is affected, and the marked differences between feebly and strongly leached-out soils turn very largely on the intensity of action of plant roots in removing the soil water Associated with this removal of water is also a transfer of mineral substances and nitrates from the subsoil to the aerial parts of the plant. Calcium, potassium and silica in particular are lifted in quantity to the leaves and stems; when the plants die they fall back on the surface

of the soil. The details vary with individual plants, and in the end striking differences may result. The general result is, however, that this process counteracts the washing down by the rainfall, and it confers upon the soils of mild humid countries one of their characteristic properties that the upper layer tends to be richer in calcium and potassium and to be more nearly neutral than the lower layers. These characters are of profound ecological significance and react greatly upon the vegetation. The plant roots evolve considerable amounts of carbonic acid. This evolution of carbon dioxide is of special importance in dry regions where soils tend to be alkaline, for it offers the possibility of reducing the alkalinity and so profoundly changing the vegetation. Experiments are being tried in various regions to find crops which by evolving large amounts of carbon dioxide from their roots, can be used for the reclamation of alkali soils. Plants also exercise marked influence on each other through their roots. The legumes or plants of the pea-bean-clover family, not only obtain nitrogen for their own needs through the activities of the bacteria that live in their root nodules, but also excrete it and make it available for other plants. On the other hand, several British investigators have conducted experiments, in which drainage through the perforated bottoms of trays in which plants were growing was permitted to flow over the roots of other plants. The latter were unfavourably affected, either through poisons formed by the roots in the trays, or through their absorption of all available nitrates, or through some combination action resulting finally in a nitrogen poverty. The imporance of roots in other connections was also pointed out: weed competition, crop rotations, and the final conversion of dead roots into soil humus.

The possibility was suggested of fighting the fungus diseases that now devastate crops by sowing or spraying the germs of counter-diseases. The suggestions came from research laboratories in widely separated parts of the world. Dr. S.D. Garrett. of the University of London, who carried on his studies in Australia on a destructive wheat disease called "take-all," found in certain types of soils a complex of fungi and other obscure organisms useful in combating the disease. From the University Farm, St.Paul Minn., Miss Delia E. Johnson reported the antagonism of a newly discovered species of bacterium against the smut diseases of corn and various small grains. A most comprehensive study in the field of microbiological antagonisms was presented by Professor S.Endo, of the University of Tokyo. He has examined dozens of kinds of bacteria and moulds for their effects on several different disease-causing micro-organisms. Some he has found to be decidedly depressing, others lesss so; a fair number completely lethal. It may be that bacteriologists and plant pathologists are ready to take a leaf out of the book of the entomologists, who long ago learned to fight enemy insects by turning their own insect enemies loose upon them.

Evolution appears to be at its most active state in producing new varieties of plant diseases affecting grain crops. What one species of smut fungus can do in the way of producing new strains was outlined by Professor E. C. Stakman, of the University of Minnesota. He described a research project in which a single reproductive cell of this smut fungus was isolated and its offspring propagated in the laboratory. Within a few months there were 162 distinct physiological strains of this one fungus from the single-celled start. These physiological strains of plant disease fungi are the more difficult to deal with because within a given species they all look alike. They are different only in their behaviour. Thus there is one well-known variety of stem-rust of grain that attacks wheat and barley but not rye and oats, another that attacks rye and barley but not wheat and oats, and still another that attacks oats but none of the other small grains. Under the microscope they all look exactly the same. The multiplication of fungus varieties that occurred with the smut specimen in the laboratory is duplicated

thousands of times over in the field. Many new varieties rise by hybridization through sexual crossing of existing varieties, but others occur without interbreeding, through the "straight evolution" process of mutation or 'sporting". There is an endless race between the plant breeder and the natural new origin of these plant diseases. The breeder will carefully produce a new crop variety that is resistant to all known diseases—only to have a newly-originated disease attack it.

Young plants, cut down and buried in the soil as fertilizer, decay much more quickly than older plants of the same kinds do. This was one of the points discussed by Dr. Selman, A. Waksman of the New Jersey Agricultural Experiment Station. In these experiments a number of plants were cut at different stages of growth and definite amounts allowed to undergo decomposition by micro-organisms, under identical conditions. Of the young plants, 73 per cent. of their material was decomposed in thirty days, while it took sixty days to decompose only 42 per cent. of the material of older plants. One of the reasons for the difference in decomposition rate is the marked difference in the chemical make-up of older and younger plants. The older plants contain higher proportions of more resistant materials, especially the celluloses and lignins. The latter substances, which are the basis of the "woodiness" of wood, are exceedingly difficult for bacteria, fungi and other micro-organisms to digest. Moreover, there is a difference between the lignins of old and young plants; in the younger state the lignins are chemically "tenderer" and easier to break down. Differences in humus formation in the soil are traceable not only to differences in the plant materials that are decomposed but also in the living agents of decay, the bacteria, molds, protozoa and other microscopic forms. Insects, worms and other larger animals that feed on dead wood and leaves also aid by chewing them into more manageable morsels for the smaller creatures. The relative abundance of these micro-organisms is influenced partly by the nature of the dead plant materials themselves, for some of them like wood, others straw, still others dead leaves; and also by such factors as temperature, moisture, soil ventilation and soil acidity or alkalinity.

X-raying plants to produce hereditary changes in their offspring is not limited in its effects to what happens in the immediate outcome. An x-rayed plant may produce offspring with new peculiarities, such as changed leaf-size or flower-colour, which will duly appear in subsequent generations. But these generations may also begin to produce other changes, even without being x-rayed themselves. Changes of this character, and an explanation for them, were described by Professor T. H. Goodspeed, of the University of California, one of the pioneers in the field of x-ray genetics. While the details of the process are highly technical, the essential fact underlying the three types of cellular change is a state of instability, of continuing change, induced in the chromosomes by the first impact of the x-ray bombardment. (*Extract from Science—Supplement*—Vol. 82, No. 2123, pp. 10–13).

ABSTRACTS

Effects of Ethylene on Plant Growth Hormone. *Science.* Vol 82, No. 2156, p. 151. Heteroauxin, or plant growth hormone (B-indolyl-acetic acid) is known to have several effects on plants, including promotion of stem elongation, inhibition of bud growth, stimulation of root formation, production of stem swellings and stimulation of epinastic movements of the leaves. With the exception of the first two, ethylene gas also has these effects.

According to A. E. Hitchcock, ethylene, heteroauxin and other substances all act in essentially the same way. This conclusion is based, apparently, on the similarity of the effects of ethylene to those of heteroauxin. There are many cases, however, where these two substances do not have the same effect.

For instance, heteroauxin increases the growth rate of *Avena coleoptiles*, and the amount of increase is dependent on the amount of heteroauxin supplied. If ethylene has the same effect, it should increase the growth rate, and the degree of increase should depend on the concentration of the ethylene. However, four groups of Avena seedlings were placed for twentyfour hours in, respectively, air 0·001 per cent, ethylene, 0·2 per cent, ethylene and 2 per cent. ethylene. The rate of growth in all three of the groups treated with ethylene was approximately the same, and was about 30 per cent. less than the rate of growth of the controls. It thus appears that, in this case, ethylene could not have acted in the same manner as a growth hormone.

It is well known also that heteroauxin increases the number of roots formed by pea cuttings. These cuttings can take up enough hormone to give maximum root formation when placed inversely in a solution of hormone for twelve hours. However, when they were placed for twenty-four hours in an atmosphere containing ethylene (whether treated with hormone or not), root formation was not affected.

Cuttings of *Salix* were also used for tests on the effect of ethylene. The experiments described here were performed in May. The cuttings were of second-year wood and about eighteen centimeters long. Four groups of cuttings were treated in different ways, as follows: (1) control, (2) 0·1 per cent. ethylene for two weeks, (3) heteroauxin applied to the top of the cuttings in the form of lanoline paste, treated both with heteroauxin and 0·1 per cent. ethylene. The roots were counted two weeks after the experiment was begun.

Method of treatment.	Average number of roots per cutting.	Increase over controls caused by treatment.
Controls	11·9 ± 0·6	
Ehtylene	16·2 ± 1·2	4·3
Heteroauxin	23·1 ± 1·5	11·2
Ethylene and heteroauxin	40·5 ± 2·3	28·6

Following are some data obtained from these experiments. The average number of roots per cutting is given, with the probable error.

It seems impossible to explain these results on the theory that ethylene acts in the same manner as a growth hormone. It will be seen that the ethylene alone increases the number of roots by 4·3, and the heteroauxin alone increases it by 11·2. If the ethylene acts in the manner of a growth hormone, the ethylene and heteroauxin together could not increase the number of roots by more than 15.5, or the sum of the two preceding figures. Nevertheless, in this experiment the increase was not 15·5 or less, but 28·6. It appears, therefore, that ethylene cannot be acting directly to stimulate root formation, but that it must in some way cause the growth hormone to become more active.

In none of the above experiments can the ethylene have acted in the same manner as a growth hormone. It seems probable, therefore, that all the effects of ethylene on growth are to be explained, not as direct effects of ethylene alone, but as effects of ethylene on a growth hormone.

Pigments of Cotton flowers. Part II. Uppam. *Gossypium herbaceum*. By K. Neelakantan, T. R. Seshadri and R. H. Ramachandra Rao. (*Proc. Indian Academy of Science*, Vol. II. No. 5, Section A, pp. 490 to 498). Petals of flowers of the *Uppam* variety of cotton, collected from the Central Farm, Coimbatore, were used by the authors, for an investigation into the nature of the pigments present. Formerly Perkin had done similar study on petals which he seems to have obtained from North India, and it is interesting to note that the present work is

an advance on Perkin's findings. Perkin reported the presence of Gossypitrin as the main component, with small quantities of iso-quercitin. The present authors however find, that while the presence of gossypitrin as the main component is confirmed, a good amount of quercitin and small quantities of a new glycoside and of gossypetin, are also present in the pigments; the authors have employed for the alkali colour reactions, buffer solutions of varying pH values from 6·8 to 11·0 and these have served to bring out clearly the differences between the two substances gossypitrin and gossypetin, and therefore helped to establish the presence of both these different compounds in the pigments.

A detailed further report on the new glycoside—which is different from gossypitrin and quercimeritrin is promised and will be looked forward to with interest.

M. R. B.

An analysis of the influence of season on photosynthesis in the tropics. By B. N. Singh and K. Kumar. (*Proc. Ind. Acad. Sci.*, Vol. II, No. 5—Section B, pp. 437 to 457). The paper sets down the record of an extremely systematic investigation into the effect of season on the photosynthesis of radish leaves collected from plants, which to supply material right through the year, were planted at successive intervals of fifteen days. Some of the interesting information obtained from the experiments, may be classified under the following heads, which, in fact, represent the lines of attack of the problem.

(1) Variations in the intensity of assimilation in *different seasons*, under *one set* of external factors—(a temperature of 29°C, light 28650 M. C. and Co_2 0·049 gm. per 100 c. c). There is a decline in the photosynthetic rate, from cool January to the spring in March and from March to the midsummer in June, with the coming in of winter in October there is a rise in assimilation. (2) Seasonal assimilation under *varying sets* of environmental factors. It was again seen that there was a decline in intensity of assimilation during the summer months, bnt increased temperature between 29—37°C is efficient in increasing assimilatory activity during this period. An increase however of illumination and carbon dioxide concentration, is more effective in increasing assimilation, during winter than during summer months. (3) *Morphological and structural changes.* The radish plants undergo changes with the season, the height de reases, the weight of radishes diminishes (from 8 lb. to ¼ lb) and total leaf becomes less, as we pass from winter to summer. (4) *The chlorophyll content* runs paralelled to the assimilatory capacity and is highest during winter and lowest in summer.

In general, photosynthesis and plant vigour are more in evidence in winter, than during summer in spite of the increase of light and temperature during the latter period. It is also interesting to find that respiratory activity is very low during the summer months and the authors suggest that the leaves adapt their structure and function according to the intensity of the external factors present.

M. R. B.

Gleanings.

Giant Tobacco. Tobacco plants as tall as trees are among the strange vegetation of the lower Andian country now being investigated by an expedition from the University of California, under Professor T. H. Goodspeed. One of the tremendous growths measured by Professor Goodspeed was sixty feet high. The expedition is engaged primarily in a search for wild relatives of the common cultivated tobaccos, to be used in hybridisation experiments. Seeds of many other plants, however are being collected. (*Sc. Supp.* Vol. 82, 21, 38, p. 7.)

On the incidence of tuberculosis in the offspring of tuberculous parents. In a total of 564 matings and 2480 offspring the proportionate incidence of tuberculosis among the offspring was found to be in the following ratios by mating types,

the incidence in the offspring from matings in which neither parent was tuberculous being taken as 1: Both parents tuberculous, 4·3; father tuberculous, mother not, 1·7; mother tuberculous, father not, 1·6; neither parent tuberculous, 1. These results suggest the inference that a person is, on the average, about four times as likely to have tuberculosis if both his parents had it than if neither parent had. Such analysis of the material as it has so far been possible to make fails to disclose any factor other than heredity playing an insignificant role in producing the observed differential distribution of offspring incidence of tuberculosis by mating types, in the present material. (*Science*—Vol. 82, No 2136, page 840.)

A Recipe to clean walls. A French patent gives a composition of 455 parts of corn flour, 40 parts of copper sulphate and 5 parts of Alum mixed with boiling water, for use in cleaning dirty walls, paints etc. (*A. E. B. in Sc. Amer.* Sept. 1935, p. 152.)

That garlic odour! × × × × A lasting remedy for offensive breath and odours seems at hand. Even the long lingering odour of garlic yields to treatment devised by Dr. H. W. Hoggard and L H. Greenbey of Yales Laboratory of Applied Physiology. The breath can be immediately and completely got rid of, by washing the teeth and tongue and rinsing the mouth with a solution of chloramine. The chlorine liberated in the mouth, reacts chemically with the essential oils and deodorises them. × × × ..... (*Sc Service—Sc. Am.* Sept. 1935.)

Sugar Statistics Sir T. Vijayaraghavacharyar gives the following interesting statistics as regards the benefits derived from the sugar industry:— Value of sugar made from cane in 1935, Rs. 12 50 lakhs. Out of this amount the price for cane is Rs. 600 lakhs; the charges for transport of canes Rs. 120 lakhs; wages of labourers Rs. 200 lakhs; and salaries of educated staff Rs. 50 lakhs. The Indian sugar Industry provides employment for about 1500 graduates and scientific men, 7500 other educated staff and 200000 skilled and unskilled labourers. (*The Mysore Economic Journal* Vol. 22, No. 1, p. 33.)

Self-imposed famine in India. When a people's diet takes a vicious path of its own towards impoverishment, it causes a graver mischief than any act of cruelty inflicted by an alien power Such has unfortunately been the case in our province. Rice has been our staple food from which we have for generations received a part of our health, strength, energy and intelligence. But curiously enough, especially among the upper class of our community, a fatal epidemic of foolishness has become prevalent which allows this principal foodstuff of ours to be depleted of its precious nourishing element. Rice mills are menacingly spreading fast extending throughout the province an unholy alliance with malaria and other flagbearers of death robbing the whole people of its vitality through a constant weakening of its nourishment We not only boil away an essential amount of nutrition from our daily ration of rice but also use elaborate machinery to polish off its skin which contains its most vital gift.

This is a self-imposed form of famine deliberately welcomed by a people who had already been suffering from the scarcity of milk and that of ghee of a non-poisonous kind.

There had been, I am told, some proposal to check the progress of this fatal evil through the intervention of legislature. I am glad that it failed, for the people must not be treated like eternal babies carefully protected by its appointed nurses from its own utter silliness. It is only for ourselves to exercise our intelligence for choosing our food which must be wholesome and sustaining. It is for the people themselves to realize that in the long run it is not cheaper to substitute the callous force of machinery for the indigenous rice-huller, oil press and grind mill for crushing the wheat.

Physical vigour born of healthy meals is valuable, not only for itself but for its power of enhancing one's earning capacity. Then again, we have to take into account the immense importance of our rural economic life whose course has been cruelly obstructed by the iron monster robbing our village women of some of their natural means of livelihood and the labouring class of its right to gather its simple living out of the gleanings from the people's own green field of life. It has gone on for long, this tampering with the time-honoured irrigation of living, in this country causing large desert tracks of privation in our villages.

Would it be too much to expect a body of volunteers to form a league whose members should take a solemn vow to use *dhenki*-hulled rice for their meals not allowing its nourishment to be stupidly thrown away by wasteful cooking? Could they not realize that it is the perpetuation of a national calamity to which most of us are daily helping by instituting in our homes an insiduous method of suicide? (Dr. Rabindranath Tagore in the *Harijan*.)

AGRICULTURAL JOTTINGS

BY THE DEPARTMENT OF AGRICULTURE, MADRAS

1. Cotton Strains. Cotton, though occupying only 6·3% of the total cropped area, forms one of the important crops of this Presidency on account of Madras producing more long staple than any other part of India and also of the relatively high value got for the produce. It is mainly grown on the black soils.

There are five distinct tracts in this Province, each growing a commercial type entirely different from one another. The Department of Agriculture has opened farms in each of them and is making intensive studies for more than a decade with the object of improving the local varieties. As a result of these investigations it has evolved more paying strains, the seeds of which are being multiplied and distributed to the cultivators.

For the Tinnevelly tract comprising the districts of Madura, Ramnad and Tinnevelly, two strains viz. C. 7 and A 10 were isolated from Karunganni cotton at the Koilpatti Agricultural Research Station. They are being grown over 70,000 acres. The former type is being grown in the southern taluks of the tract while the latter is preferred in the northern part. They have a mean fibre length of ⅞″ with a ginning percentage of 30 as compared with ¾″ staple and a ginning percentage of 27 of the local mixture. In yield it is as good as the local Tinnies. The lint fetches a premium of Rs. 5 per candy of 500 lb. It is declared suitable to spin 24's to 30's warp yarns.

Recently another strain called Koilpatti 1 has been isolated. It has an efficient plant body, a ginning percentage of 31 and a spinning value of 28's to 32's. It is able to withstand better the untimely February rainfall which causes a high shedding of buds and bolls in the other strains. Its average yield is therefore higher. The distribution of the seed was started only recently.

Cambodia Co. 2 is the strain recommended by the Department for cultivation in the Cambodia tract. Though it thrives best only on red and mixed soils, it is able to tolerate wide range of climatological conditions. It is a vigorous type with broad leaves and big bolls and is being grown over 75,000 acres. There is a very great demand for its seeds, which often secures a premium of 40% over the bazaar rate. It has a staple of 9/10″ and ginning percentage of 35. It gives an increased yield of 15% over the local unselected type. It is suitable to spin 28's and is offered a premium of Rs. 8 per candy of lint.

For Bellary and Anantapur districts—called Western tract in commerce—strain H. 1 evolved at the Hagari Agricultural Research Station has been found to be very suitable. It is being cultivated over an area of 200,000 acres. Its

staple length and the ginning percentage are 7/8" and 29 respectively. Compared with the local Jawari cottons its ginning percentage is higher by 3%. Its lint fetches a premium of Rs. 12 per candy of 50 lb. It is capable of spinning 26's to 30's yarns.

In the Northerns tract, seeds of strain N. 14 was under distribution for a long time. It has a staple of 7/8" and can spin up to 40's. It is highly valued by commerce on account of its fine and strong fibre. In certain years it fetched the very high premium of Rs. 70 over the local market rates, and was cultivated over more than 30,000 acres. But of late its acreage has fallen on account of its low ginning percentage and its unsuitability to soils other than red and mixed. Attempts are already on foot to evolve a strain suited to the black soils of this tract.

'Cocanadas' is the name given to the cotton grown in Guntur, Kistna, Nellore and Godavari district. Unlike other cottons, it has a deep brown lint and is much wanted by the traders for its keeping colours fast. As a result of the breeding work done at Guntur, a strain No. 171 has been isolated. It has a length of 7/8" and a ginning percentage of 26. It yields 10% more than the locals. It spins up to 26's while the cotton from which it was selected spins only 16 to 18's. Its distribution has been started only recently. It is hoped that it will be grown over very large areas before long.

2. Dry farming practices in Ceded Districts. In parts of the Bombay Presidency where the average rainfall does not exceed 22 inches per annum it has been shown that as much as fifty per cent. of the rainfall may be lost to the crop. This is due to what is common experience viz. that quantities of rain water run off the land, some is lost by the drying effect of the sun, and a further quantity is lost through natural causes inherent in the physical qualities of the soil.

In recent years special attention has been given to this problem in the Ceded districts. The main effort has been directed towards increasing by means of improved tillage firstly the penetration of rain water and secondly its retention by the soil. In the case of clay soil penetration of rain water is generally far less than is generally believed. In a type of black cotton soil in the Coimbatore district it has been shown, for example, that rain water does not enter the soil to a greater depth than 2 ft. from the surface. Similarly, in Egypt on land irrigible from the Nile it has been shown that if certain of the land is flooded for 30 days it is possible for the water to penetrate only 2 ft. in depth.

The problem in the dry tracts of this Presidency therefore, as elsewhere, is to examine the efficiency of dry farming practice in respect of water penetration and retention. In the Ceded districts the ryots generally are well aware of the usual methods of arresting excessive run off of water, but such are expensive. Further, over large areas there is no material with which to erect embankments against rainwash.

The Department of Agriculture have overcome this difficulty by designing a special implement which is capable of throwing up a field bund. The implement which costs Rs. 7 –8—0 can be drawn by medium sized bullocks.

At Sanganakallu 3½ miles from Bellary. an area of land was ploughed at the beginning of the present season with an iron plough costing Rs. 32. This is in contrast to the local practice of tillage with a country plough or *guntaka*. It is claimed that the use of this improved implement results in more even tillage and therefore better conditions for the penetration of water. Before the sowing of cotton the land was protected against rain wash by the erection of bunds. Part of a holding was treated in this way and part was cultivated by local methods. The harvest of cotton has started and the first pickings show that the improved dry farming practice has given about fifteen per cent. more kappas than the local practice. Similar plots have been laid down in several centres of

demonstration work in Bellary and Anantapur districts. In some cases there are early sown crops and in others *hingari*. The results will be known later.

3. **Improved seed of Ragi and *Gante* (*cumboo*) for the Vizagapatam District.** On the Anakapalle Agricultural Research Station, two strains of early Ragi Nos. 525 and 355 have been evolved, the former having been found to grow well in the late season also. During the past 3 years, these have been tried and distributed where found promising. In these three years, No. 525 gave over 139 plots, an increase in yield, over the local bulk, of 273 lbs. (24·7 %) of grain valued about Rs. 5—8—0 per acre. Judging from the results of the plots in the different taluks the strain appears to be more suited to the southern taluks of the district than to the northern ones, the degree of suitability being also dependent on the seasonal conditions. Wherever paddy is to be planted late this strain will prove very useful, and ryots are advised to replace the local seed with it as early as possible.

Ragi No. 355 has during the past 3 years given on an average over 89 plots an increased yield of 224 lbs. (19·2 %) of grain per acre valued Rs. 4—8—0 over the local bulk. The success of this strain in the different taluks has been more varied, any delay in planting this strain, which is earlier than the other, affecting the yield. Where paddy is intended to be planted early, this would be a suitable strain to take up.

Next to ragi, *gante* (*cumboo*) forms an important part of the ryots' food in the Vizagapatam District. It occupies over 2 lakhs of acres in this district, which possesses the largest gante growing area in the Telugu districts. During the past 3 years two new varieties of gante one from Bombay and another from the Punjab were tried at Anakapalle and released for trial in the District during the last season.

In spite of the adverse season, the Punjab gante gave, on an average of 9 plots, an increased yield of 288 lbs. of grain (39%) valued about Rs. 5—12—0 per acre over the local. The Bombay gante gave an increased yield of 221 lbs. (30%) valued Rs. 4—4—0 per acre over the same number of plots. If the strains continue to prove superior in further trials, as it is hoped they will, they will be of great help to the ryots of the southern taluks of the district especially the coastal ones where the rainfall is lower, and where this crop is largely grown in preference to Ragi, or which requires heavier rain to cultivate. (By Courtesy of Director of Agriculture.)

Crop and Trade Reports.

Cotton Raw Receipts at Presses and Spinning Mills.

Loose Cotton.	Bales (against an estimate of 445,600 bales).	Figures for corresponding period in previous year.
1—2—35 to 20—12—35.	455,523.	580,022.
,, 27—12—35.	458,876.	584,031.
,, 3—1—36.	462,558.	586,712.
,, 10—1—36.	466,742.	588,722.
,, 17—1—36.	470,479.	592,005.
,, 24—1—36.	472,935.	597,224.
,, 31—1—36.	478,597.	599,497.

Pressed Cotton.	Receipt in Mills.	Export by Sea.	Import by Sea.
1—2—35 to 20—12—35.	290,319.	133,844.	43,218.
,, 27—12—35.	292,099.	134,454.	43,571.
,, 3—1—36.	297,183.	139,759.	47,017.
,, 10—1—36.	300,788.	141,324.	47,199.
,, 17—1—36.	304,446.	142,842.	47,855.
,, 24—1—36.	310,306	143,339.	49,049.
,, 31—1—36.	317,371.	147,224.	49,525.

(Bale = 400 lbs.).

Paddy—Final forecast report—1935-36. The average of the areas under paddy in the Madras Presidency during the five years ending 1933-34 has represented 13·5 per cent. of the total area under paddy in India. The area sown with paddy in 1935-36 is estimated at 11,000,000 acres as against 10,828,000 acres for the corresponding period of last year and the finally recorded area of 11,055,587 acres in 1934-35. The present estimate falls short of the final area by 0·5 per cent. and the area of 11,381,660 acres in an average year by about 3·4 per cent. 1,403,000 acres have been reported as sown since the last December forecast was issued. The extent so sown was large in Ganjam (125,000 acres). East Godavari, Chingleput (118,000 acres), South Arcot, North Arcot, Madura (103,000 acres) and Ramnad (152,000 acres). The area sown in December and January was greater than that sown in the corresponding period of last year by 286,000 acres or by about 26 per cent. The area under second crop paddy is expected to be generally below normal. The harvest of paddy is in progress. The yield is expected to be normal in Kistna, Guntur, Kurnool, Bellary, Cuddapah, North Arcot, Madura, and the Nilgiris, slightly above normal in South Kanara and below normal in the other districts. The yield was the lowest in Ganjam (24 per cent.). The seasonal factor for the Presidency works out to 94 per cent. of the average as against 96 per cent. in the season and crop report of last year. On this basis, the yield works out to 98,090,000 cwt. of cleaned rice. This represents a decrease of about 1·6 per cent. when compared with the estimate of 99,622,000 cwt. in the season and crop report of last year. The yield in an average year is estimated at 107,776,000 cwt.

The wholesale price of paddy per imperial maund of 82-2/7 lb. as reported from important markets towards the close of January 1936 was Rs. 2—12—0 in Nellore and Erode, Rs. 2—10—0 in Vizianagaram and Cuddapah, Rs. 2—9—0 in Nandyal, Rs. 2—8—0 in Berhampore, Rs 2—6—0 in Madura and Tinnevelly, Rs. 1—11—0 in Kumbakonam and ranged from Rs. 1—15—0 to Rs 2—4—0 in the other markets. When compared with the prices reported in the previous month, these prices are stationary in Berhampore, Vizagapatam, Erode and Tinnevelly and are lower by 27 per cent. in Kumbakonam and Salem, 24 per cent. in Trichinopoly, 18 per cent. in Vellore, 15 per cent. in Cuddapah, 14 per cent. in Madura, 9 per cent. in Cocanada, 8 per cent. in Negapatam, 6 per cent. in Guntur, and 2 to 4 per cent. in the other markets.

Sugarcane—Third or final report, 1935. The average of the areas under sugarcane in the Madras Presidency during the five years ending 1933-34 has represented 3·7 per cent of the total area under sugarcane in India. The area planted with sugarcane up to the 25th December 1935 is estimated at 131,120 acres. When compared with the area of 122,470 acres estimated for the corresponding period of last year, it reveals an increase of 7·1 per cent. The estimate of the previous year was less than the final area of 125 310 acres by about 2·3 per cent. The present estimate of area exceeds the second forecast by 5,730 acres. The excess occurs mainly in Ganjam, West Godavari, Guntur, Bellary, South Arcot, North Arcot, Salem, Coimbatore, Trichinopoly and South Kanara. The increase in area in comparison with the final forecast of 1934 occurs in all districts outside Ganjam. Guntur, Anantapur, Salem, Coimbatore, Madura and Ramnad. The harvest has just commenced and normal yields are expected in all districts outside the Circars (Guntur excepted) Anantapur. Salem and Coimbatore where the yield is expected to be below normal. The seasonal factor for the Presidency is calculated at 97 per cent of the average as against 91 per cent in the previous year. On this basis, the yield is estimated at 360,410 tons of Jaggery as against 320,940 tons estimated in January 1935, an increase of 12·3 per cent. The final estimate for 1934-35 was 351,100 tons.

The wholesale price of Jaggery per imperial maund of 82-2/7 lb., as reported from important markets towards the close of December 1935 was Rs. 6—14—0 in Nandyal, Rs. 6—6—0 in Tuticorin, Rs. 5—15—0 in Kumbakonam, Rs. 5—12—0 in Calicut, Rs. 5—9—0 in Madura, Rs. 5—4—0 in Bezwada, Rs. 4—15—0 in Masulipatam, Guntur, Bellary and Cuddapah, Rs. 4—8—0 in Rajahmundry, Rs. 4—7—0 in Salem, Rs. 4—6—0 in Vellore, Rs. 4—4—0 in Cocanada and Ellore, Rs. 4—2—0 in Vizagapatam, Rs. 3—14—0 in Coimbatore, Rs. 3—13—0 in Trichinopoly and Rs. 3—1—0 in Tinnevelly. When compared with the prices of the previous month, these prices reveal a fall of 19 per cent in Ellore, 14 per cent in Vizagapatam, Masulipatam, Nandyal and Trichinopoly, 13 per cent in Coimbatore, 10 per cent in Guntur, 9 per cent in Bezwada, 8 per cent in Bellary, 5 per cent in Rajahmundry and 4 per cent in Cocanada and a rise of 4 per cent in Cuddapah and Tuticorin. The price remained stationary in Vellore, Salem, Tinnevelly, Kumbakonam and Madura.

Groundnut—Final report—1935. The average of the areas under groundnut in the Madras Presidency during the five years ending 1933-34 has represented 48·2 per cent. of the total area under groundnut in India. The area sown with groundnut in the Presidency in 1935 is estimated at 2,492,500 acres. When compared with the corresponding estimate of 2,323,300 acres for the previous year and the actual area of 2,350,934 acres according to the season and crop report of the previous year, the present estimate reveals an increase of 7·3 and 6 per cent. respectively. The estimated area for this year is less than the normal area of 3,317,650 acres by about 25 per cent. The increase in area is general outside Ganjam, Vizagapatam, East Godavari, Bellary, Anantapur, Coimbatore, the South (Tanjore excepted) and Malabar. The increase is marked in the central districts (Coimbatore excepted). The area in Bellary and Anantapur has fallen from 412,600 acres to 292,000 acres due mainly to an increase in the area under cotton and other dry crops. The harvesting of the summer and early crop of groundnut was finished by October. The harvesting of the winter or main crop is proceeding. The crop is expected to be below normal in Vizagapatam, Guntur, Cuddapah, South Arcot, the Central districts, Tanjore, Tinnevelly and Malabar. The seasonal factor for the Presidency works out to 92 per cent. of the average as against 78 per cent in the previous year according to the season and crop report. On this basis, the yield is expected to be 1,143,400 tons of unshelled nuts as against 920,260 tons in the previous year, an increase of about 24 per cent. The yield in an average year is estimated at 1 660,990 tons.

The wholesale price of groundnut shelled per imperial maund of 82-2/7 lbs. as reported from important markets towards the close of December 1935 was Rs. 5—14—0 in Tinnevelly Rs. 5—13—0 in Cuddalore, Rs. 5—8—0 in Vizagapatam, Rs. 5—5—0 in Berhampore, Rs. 5—4—0 in Negapatam, Rs. 5—2—0 in Guntur, Rs. 5—0—0 in Vizianagaram and Cocanada, Rs 4-15 0 in Nandyal and Cuddapah, Rs. 4—12—0 in Adoni, Vellore and Salem, Rs. 4—11—0 in Coimbatore, Rs. 4—8—0 in Madura and Rs. 3—12—0 in Ellore. When compared with the prices for October 1935, these prices reveal a rise of 21 per cent. in Cuddalore, 1 per cent. in Ellore, 5 per cent. in Vizagapatam, Guntur and Nandyal and 4 per cent. in Cuddapah and a fall of 14 per cent. in Coimbatore, 7 per cent. in Berhampore, 6 per cent. in Vellore, 5 per cent. in Vizianagaram, 4 per cent. in Madura and 3 per cent. in Adoni and Salem. The price remained stationary in Tinnevelly.

Gingelly—Intermediate report—1935-36. Sowings of late gingelly are in progress in most districts. The condition of the crop is generally satisfactory.

Mr. T. LAKSHMANA ROW—A Short Sketch.

Tandalam Lakshmana Row, Retired Assistant Agricultural Chemist, was born on 16th December 1880 in Kumbakonam. His father Mr. T. Gopala Row was one of the earliest graduates of the Madras University and as a veteran educationist, his name is still remembered in the Kumbakonam College. Born of an aristocratic Tanjore Mahratta family, Mr. Lakshmana Row was the youngest of seven brothers, who all attained high positions in the Revenue and Judicial departments.

Young Lakshman had his early education in the Town High School, Kumbakonam, and then after his F. A. in the Kumbakonam College went to the Presidency College, Madras for his B. A., under Principal Stone and Professor Jones. He graduated in 1902, but did not seek employment for some years, entering service for the first time in 1906, as Librarian in the office of the Government Botanist, Madras. When this officer, who was none other than Dr. C. A. Barber, was transferred to Coimbatore, as Economic Botanist, Mr. Lakshman Row also accompanied him and was appointed Librarian at the Agricultural College. In 1910, however, he was drafted on to the Agricultural Chemistry Section, where he spent the remaining period of his service. He continued as an Assistant in the Chemistry section till 1922, when he went on 2 years' leave to England at his own expense and took a diploma at the Imperial College of Science, London. On his return in 1924, he was gazetted as Assistant Agricultural Chemist, a rank he occupied to the date of his retirement.

Unassuming and of a retiring disposition, Mr. Lakshmana Row never cared to be in the lime-light, but those who have worked with him, know what a methodical and precise worker he was, with an amazing degree of patience and perseverence. With a natural distaste for publicity, he refrained from rushing to print, otherwise there would have been a lot more of publications to his credit, than there are now. During his term as Assistant Agricultural Chemist, he was responsible for a number of investigations, chief among which may be mentioned (1) Methods for improving jaggery manufacture at Hospet (2) Investigations into the betel vine disease at Vellalur (3) The preliminary work connected with the lay out and start of the soil moisture plots at Coimbatore (4) Investigations into the methods of estimating the PH values of soils and (5) The soil survey of the Lower Bhavani Project areas.

Outside office, Mr. Lakshmana Row was a man of varied and wide tastes and hobbies. A scholar with a choice collection of favourite authors, an artist with a taste for music and paintings, an enthusiast in photography, radio and mechanics, he still found time to take long open-air walks, which constituted his only exercise.

Careful and scrupulous in his manners and behaviour, he was affable and amiable and earned the love and respect of all he came in contact with.

In the early years he was connected with the growth of the Officers' Club, of which he was the Secretary and once he has been Treasurer of the Madras Agricultural Students' Union. In his retirement, we wish him all health and happiness.

[*Ed. M. A. J.*]

College & Estate News.

Association of Economic Biologists. The Annual Meeting of the Association of Economic Biologists was held on 25th January, after the usual tea and photo. The annual report was read and several amendments to the rules were passed. It was decided (a) to reduce the rate of subscription from Rs. 3 to Rs. 2 per annum (b) to have an additional Vice President from among the members outside Coimbatore and (c) to have an Assistant Secretary and Treasurer. The following office bearers were then elected. *President*: Mr. V. Ramanathan, *Vice Presidents:* Mr. K. Krishnamurthi Rao and Dr. T. Ekambaram, *Assistant Secretary and Treasurer*: Dr. S. Kasinatha Iyer and *Committee Members:* Mr. K. Ramiah and Dr. E. K. Janaki Ammal. The retiring President Mr. K. Ramiah delivered an interesting and illuminating address on "Genetics in Rice".

A Fire Accident. We are sorry to inform our readers that a fire broke out at the Residence of Mr. N. L. Dutt, Second Cane Breeding Officer at Chettipalayam, on the 1st inst. Immediately on receipt of news, Mr. B. M. Lakshmipathi and Mr. D'Cruz, rushed to the spot and managed to keep the fire under control till the arrival of the Fire Engine from Coimbatore. The people of surrounding villages, the officers of the Sugarcane Station, and a number of estate residents, rendered great help in extinguishing the fire. It would appear, that the rear verandah of the bungalow caught fire while the immates were fast asleep upstairs, and long before they could realise that something was amiss, the flames had almost enveloped them. Mr. Dutt with singular presence of mind rescued his wife and children, and pluckily rushed out into the open before the flames glutted his sleeping apartment. We congratulate him and his family, on their providential escape.

Visitors. Rao Bahadur D. Ananda Rao, Director of Agriculture, Madras, Rao Bahadur B. Viswa Nath, Ag. Director of Imperial Research Institute, Pusa and Mr. Kapoor, Economist, I. C. A. R., visited Coimbatore during the last week of January.

I. C. A. R. The Director of Agriculture. Mr. K. Ramiah, Mr. M. C. Cherian, and Mr. C. Vijiaraghavan visited Delhi in connection with the sub-committee meeting.

Students' Corner. *Tour.* Students of 2nd year returned from their fortnight's Educational Tour in the Circars on the 20th January.

On 7th, 8th and 9th February, Students of class iii were on tour and visited Puliampatti, Gobichettipalayam and Tiruppur.

On 8th Students of class ii were on Tour and visited Gobi where irrigation experiments are being carried out by the department.

Students' Club. A general body meeting was held under the presidency of Mr. R. C. Broadfoot, Principal of the College when a resolution of condolence over the untimely demise of the student, late Mr. K. D. Dharmarajan was moved from the chair and was passed all standing—students and the staff.

The Secretary was authorised to convey the resolution to the bereaved parents.

Sports. With the Annual Club Day coming off on the 22nd instant the activities of the club were at their height. Various indoor games, inter tutorial football and hockey matches, inter class Parnell cup hockey matches have been in progress. A full account of the club day activities will appear next month.

Literary. Essay and elocution competition have been conducted the subject for the former being "Why I have chosen agriculture as a career" and for the latter, "The Value of Hostel Life".

Weather Review (JANUARY 1936).

RAINFALL DATA

Division	Station	Actual for month	Departure from normal	Total since January 1st	Division	Station	Actual for month	Departure from normal	Total since January 1st
Circars	Gopalpore	1·6	+1·4	1·6	South	Negapatam	0·0	−1·7	0·0
	Berhampore*	1·7	+1·4	1·7		Aduthurai*	0·1	−4·4	0·1
	Calingapatam	0·1	−0·2	0·1		Madura	0·1	−0·5	0·1
	Vizagapatam	1·0	+0·5	1·0		Pamban	0·3	−1·9	0·3
	Anakapalli*					Koilpatti*	0·1	−1·4	0·1
	Samalkota*	0·3	+0·2	0·3		Palamkottah	0·1	−1·4	0·1
	Maruteru*								
	Cocanada	1·2	+1·0	1·2					
	Masulipatam	0·0	−0·2	0·0	West		0·4		
	Guntur*	0·0	−2·9	0·0	Coast	Trivandrum	0·0	−4·3	0·4
						Cochin		−0·7	0·0
Ceded	Kurnool	0·0	−0·2	0·0		Pattambi*			
Dists.	Nandyal*	0·0	−0·1	0·0		Taliparamba*			
	Hagari*	0·0	−0·1	0·0		Kasargode*	0·0	−0·2	0·0
	Bellary	0·0	−0·1	0·0		Nileshwar*	0 0	−0·2	0·0
	Anantapur					Mangalore	0·0	−0·1	0·0
	Cuddapah	0·0	−0·5	0·0					
Carnatic	Nellore	0·0	−1·7	0·0	Mysore	Chitaldrug	0·0	−0·3	0·0
	Madras	0 2	−1·2	0·2	and	Mysore	0·0	−0·2	0·0
	Palur*				Coorg	Mercara	0·0	−0·2	0·0
	Palakuppam*	0·0	−1·1	0·0					
	Cuddalore	0·1	−1·5	0·1					
						Kodaikanal	0·2	−2·8	0·2
Central	Vellore	0·0	−1·4	0·0	Hills.	Coonoor	1·5	—	1·5
	Hosur cattle farm*					Ootacamund*			
						Nanjanad*	0 2	−1·1	0·2
	Salem	0·0	−0·3	0·0					
	Coimbatore	0·0	−0·6	0·0					
	Coimbatore Res. Inst.*								
	Trichinopoly	0·4	−0·4	0·4					

Meteorological Stations of the Madras Agricultural Department.

Summary of Weather Conditions. Dry weather prevailed over the Peninsula for the greater part of the month. Scattered falls of rain occurred in the North Madras coast and South East Madras during the later half.

Maximum temperatures were above normal at most places in the Peninsula while the minimum temperatures were markedly below normal in and around Punjab.

Rainfall was in large defect in the Peninsula and locally in excess in the North Madras coast.

Chief falls reported were :—

Berhampore	...	...	1·3″	
Vizagapatam	...	...	0·7″	on the 19th.
Cocanada	...	...	0·9″	,, 20th.
Coonoor	...	...	0·5″	,, 21st.
Coonoor	...	...	0·8″	,, 28th.

Weather Report for the Research Institute Observatory.

Report 1/36.

Absolute Maximum in shade	91·8°F.
Absolute Minimum in shade	58·8°F.
Mean Maximum in shade	87·8°F.
Departure from normal	+ 1·8
Mean Minimum in shade	64·4°F.
Departure from normal	Nil.
Total Rainfall	Nil.
Departure from normal	0·48
Heaviest fall in 24 hours	Nil.
Total number of Rainy days	Nil.
Mean daily wind velocity	2·5 M. P. H.
Mean humidity at 8 hours	73·8%
Departure from normal	– 1·7
Total hours of bright sunshine	295·8
Mean daily hours of bright sunshine	9·5

Summary. Rainfall for the month was nil and below normal. Maximum temperature was above normal. Lowest minimum recorded was 58·8°F on the 7th instant.

A. S. R. & D. V. K.

Departmental Notifications.

Retirement. Mr. M. Ramaswami Pillay, Sub Assistant in Paddy will retire with effect from 16—9—'36, and Mr. G. R. Venkatachalapathi Raju, A. F. M., Coimbatore from 1—1—'37.

Promotions. Mr. A. Gopalan Nair and Mr. T. G. Anantarama Iyer to be substantive II Grade. Mr. M. Satyanarayana, to be substantive IV Grade. From III to II Grade : Mr. K. Govinda Nambiar. IV to III Grade : Mr. K. Avadainayagam Pillay without prejudice to his Gazetted appointment. V to IV Grade : Mr. M. K. Swaminatha Iyer and Mr. A. Krishnaswami Iyer. Mr. P. S. H. Narayanaswami Naidu, substantive IV Grade.

Leave. Mr. G. K. Subramania Iyer, l. a. p. for 4 months.

New Appointments. Upper Subordinate III Grade, with effect from 30-1-1936. Mr. K. M Narayanan, B. Sc. Ag., Assistant in Chemistry. Mr. K. Meenakshisundaram, Agricultural Section, IV Circle. Mr. V. V. Rajagopalan, Assistant in Oil Seeds. Mr. P. C. Sahadevan, Assistant in Chemistry.

Manager's Notice.

Subscribers and members are requested to remit their dues at an early date. In the absence of instructions to the contrary the March issue of the journal will be sent by V. P. P., to those whose subscriptions have expired, by December and whose remittance has not been received so far.

M. A. S. U.